Immingham Green Energy Terminal

TR030008

Volume 5

5.2 Consultation Report Appendices

Appendix G: Preliminary Environmental Information Report

Section (37)(3)(c) of the Planning Act 2008

Regulation 5(2)(q)

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

September 2023

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

Immingham Green Energy Terminal

Development Consent Order 2023

5.2 Consultation Report Appendices

Appendix G: Preliminary Environmental Information Report

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Appendix G	Preliminary Environmental Information Report (PEIR)
G.1	PEIR
G.2	PEIR non-technical summary

G.1	PEIR

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 1: Introduction

Associated British Ports

Document History

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Table of contents

Tables

1 Introduction

1.1 Background

1.1.1 This Preliminary Environmental Information (PEI) Report has been prepared by AECOM Ltd (AECOM) on behalf of Associated British Ports ('ABP') ('The Applicant'). It supports a proposed application ('the Application') to be made to the Secretary of State (SoS) for Transport seeking Development Consent to construct, operate and maintain a multi-user bulk liquid Green Energy Terminal, which would be located on the eastern side of the Port of Immingham (hereafter 'the Port'), as well as associated development (collectively termed 'the Project'). A part of the associated development is the construction and operation of a green hydrogen production facility for the production of green hydrogen from imported ammonia on site by Air Products BR Ltd. ("AP").

1.1.2 This PEI Report presents a description of:

a. The Project.

b. The anticipated likely significant environmental effects of its construction, operation (including maintenance) and, where relevant, decommissioning, based on the PEI available at the time of writing.

c. The measures being developed to avoid or reduce such effects.

d. The potential for cumulative effects arising from the impact of the Project and the impacts of other development proposals.

e. The need for the project and alternative sites, technologies and layouts considered for the Project and the reasons for the option selected.

1.1.3 The PEI Report is provided to enable stakeholders and consultees to develop an informed view of the likely significant environmental effects of the Project. The Applicant will take into consideration any comments received through consultation on the PEI Report, to identify opportunities for the refinement of the design of the Project, including the Associated Development components and prior to finalising the Environmental Impact Assessment (EIA) for the Project that will accompany the Application in the form of an Environmental Statement (ES) .

1.1.4 The location of the Project Site is shown in **Figure 1.1** (PEI Report, Volume III). The Project and the Project Site and its surroundings are described in **Chapter 2: The Project**).

1.2 The Applicant

1.2.1 ABP was established in 1981 following the privatisation of the British Transport Docks Board. It is the largest ports group in the UK, owning and operating 21 ports and other transport-related businesses across England, Wales and Scotland.

1.2.2 On the Humber, ABP owns and operates four ports, namely the Port and the ports of Hull, Grimsby and Goole, which together constitute the largest ports complex in the UK. The Port is the largest and busiest of ABP's four Humber ports.

1.2.3 ABP's statutory undertaking at Immingham, the 'statutory port estate', covers some 480 hectares (ha). The majority of the port estate falls within the administrative boundary of North East Lincolnshire Council (NELC), although the western part of the Port falls within the administrative boundary of North Lincolnshire Council (NLC).

1.2.4 The Port comprises a number of discrete operational areas handling a diverse trade base including liquid fuels, solid fuels, ores, and ro-ro freight being handled from existing in-river jetties. These include the Eastern and Western Jetties, the Immingham Oil Terminal, the Immingham Gas Terminal, Immingham Outer Harbour and the Humber International Terminal ("HIT").

1.2.5 The Project, if consented, will be located fully within an extended Port of Immingham SHA area where the Applicant is the Statutory Harbour Authority (SHA). In this capacity, the Applicant is responsible, with a set of powers and duties which include the management and regulation of the safety of navigation and marine operations in its SHA area.

1.2.6 Humber Estuary Services (HES) is the SHA for the wider estuary and Competent Harbour Authority (CHA) with respect to pilotage for the Humber Estuary and the ABP docks - and other port facilities - within. As the CHA, HES has the power to issue Pilotage Directions that prescribe which vessels require a Pilot or Pilot Exemption Certificate (PEC) holder when navigating within the CHA area.

1.2.7 In addition to the Project, ABP is also proposing to construct a new Roll-on Roll-off (Ro-Ro) facility within the Port principally to service the embarkation and disembarkation of commercial cargo. The facility will include an element of passenger use when the demands of the Ro-Ro cargo operation allow. The proposed Ro-Ro facility is being promoted as a Nationally Significant Infrastructure Project (NSIP) and is known as the 'Immingham Eastern Ro-Ro Terminal' (IERRT). IERRT will comprise on the marine side, the construction of a new Ro-Ro jetty with three berths, together with appropriate dredging and on the landside, the provision of an area for unit load/vehicle storage and necessary new Terminal buildings. IERRT is also at the planning stage but is entirely separate from this Project's proposals which are the subject of the PEI Report.

1.3 Air Products BR Ltd

1.3.1 AP is a world-leading industrial gases company in operation for nearly 80 years, and more than 60 years in the UK and Ireland with over 1000 UK&I employees working across 35 production facilities in addition to a number of hydrogen refuelling stations and hydrogen, nitrogen and oxygen plants. The company develops, engineers, builds, owns and operates some of the world's largest industrial gas projects.

1.3.2 In 2020, AP announced the signing of an agreement for a world-scale green hydrogen-based ammonia production facility powered by renewable energy. The project is sited in NEOM in the north west corner of the Kingdom of Saudi Arabia, and will produce green ammonia for export to global markets. AP plans to invest in a new green hydrogen production facility at Immingham, supported by a downstream distribution network. The plan is to import renewable (green)

ammonia to convert into green hydrogen to fuel heavy transport, such as Heavy Good Vehicles (HGV) and buses. This is one of the most challenging and polluting sectors to decarbonise and a priority for meeting net zero in the UK.

1.3.3 AP and ABP have entered into an agreement for the alteration of the existing harbour facility and associated landside development at the Port to facilitate the delivery of ammonia and its storage and processing to produce green hydrogen.

1.4 The Project Objectives

1.4.1 The objectives for the Project are as follows:

a. To provide essential port infrastructure, capacity and resilience to support the growth and changing strategic needs of the energy sector to support decarbonisation within the Humber Industrial Cluster and the Humber Enterprise Zone.

b. To provide capacity to support import and export of a range of liquid bulk products including (i) ammonia (to produce green hydrogen) to help decarbonise the United Kingdom's (UK) transport sector and (ii) carbon dioxide (CO_2), to facilitate carbon capture and storage, both of which will assist transition towards net zero.

c. To deliver and operate new port infrastructure, and its first user's Hydrogen production facility, in a safe, efficient and sustainable manner by making effective use of available land, water, transport and utility connections which exist in and around the Port of Immingham.

d. To minimise adverse impacts on the environment and safeguard the health, safety and amenity of local residents.

e. To enhance both the local and regional economy through direct investment in and around the Port of Immingham and by partnering with the supply chain, providing opportunities for training, upskilling, apprenticeships and local employment.

1.1.2 The terminal is proposed to be operated by ABP as a common user terminal facility, providing port capacity for multiple customers. It is anticipated that customers are likely to import or export a range of different liquid bulk products that are compatible with green ammonia from a health and safety perspective. Ammonia is a liquid bulk product likely to use the terminal as part of the transition to net zero, as is CO_2.

1.4.2 The green hydrogen production facility would directly support the aims of the UK Government's British energy security strategy (Ref 1-1) with the production and delivery of low-carbon ("green") hydrogen, contributing to decarbonisation of transport and the UK's journey to net zero, helping to improve Britain's energy security and supporting the Levelling Up agenda. The Project is anticipated to produce up to 300 MW of hydrogen per annum, the equivalent of up to 9.5 billion MJ per annum. Depending on market demand, it is estimated that this will meet up to 3% of Government's hydrogen production capacity target.

1.4.3 The Project would initially be used as a conduit for the import of green ammonia (NH_3) from NEOM in Saudi Arabia initially, but potentially also from Oman and

Rotterdam, to be converted to green hydrogen. To facilitate this, an associated hydrogen production facility would be constructed, which would be owned and operated by AP. AP would be the first ABP customer to use the jetty. Other customers with other proposed developments or uses are expected to come forward in due course and these are likely to include customers in the carbon capture and storage sector.

1.5 The Project

1.5.1 In summary, the Project would comprise:

a. On the marine side (the NSIP):

   i. A jetty, consisting of an approach trestle, approximately 1.1km in length, leading to up to two berths, including loading platforms and berthing and mooring dolphins with link walkways; and

   ii. Topside infrastructure on the jetty for the handling of bulk liquids, including loading arms and pipelines.

b. On the land side (the Associated Development):

   i. An access road to the jetty;

   ii. Two operational sites supporting hydrogen production facilities (an East Site and a West Site);

   iii. Pipework, pipelines and utilities (i) between the jetty and the green hydrogen production facility on the East Site and (ii) between the two green hydrogen production facility sites and (iii) between buildings and plant within the production operation facilities;

   iv. Refrigerated ammonia storage tank (on the East Site);

   v. Hydrogen production units that convert ammonia to produce the green hydrogen (on both East and West Sites);

   vi. Hydrogen liquefiers (on both East and West Sites) to liquify the hydrogen for temporary storage (on the West Site);

   vii. Loading bays to fill road tankers with liquified hydrogen which would then be distributed to hydrogen filling stations throughout the UK (on the West Site);

   viii. Ancillary buildings and works;

   ix. Access from the public highway to the two hydrogen production sites; and

   x. Temporary construction areas.

1.5.2 Further information on the Project is provided in **Chapter 2: The Project**.

1.6 The Development Consent Process

Nationally Significant Infrastructure Project

1.6.1 The NSIP would comprise the construction of a jetty with up to two berths capable of receiving and discharging tanker vessels transporting bulk liquids.

1.6.2 The maximum number of vessel calls to the jetty, with both berths in place, is estimated to be approximately 400 per annum, which would include vessel movements importing and exporting ammonia to and from the hydrogen production facility. It has been assumed that up to 200 vessel calls would be to Berth 1 and up to 200 vessel calls would be to Berth 2.

1.6.3 The jetty would be capable of receiving and discharging gas carrier vessels of a variety of sizes. The maximum dimensions of a very large carrier using Berth 1 of the jetty would be approximately 250m in length, approximately 45m beam and 14m draft and which have a capacity when fully laden of approximately 55,000 tonnes. Taking into account a maximum 3-day discharge period per vessel, an approximate capacity of 55,000 tonnes per vessel and allowing for weather delays and maintenance periods, this would result in a *minimum* annual import capacity of over 5.5 million tonnes for Berth 1 alone with a *maximum* capacity of in excess of 11 million tonnes. Similar considerations for Berth 2, which would widen the range of ships able to use the jetty and based on an approximate capacity of 25,000 tonnes per vessel, would result in a maximum capacity for the second berth of more than 5 million tonnes. This would result in a maximum annual import and export capacity for the jetty, with both berths operational, of approximately 16 million tonnes.

1.6.4 On this basis, the proposed “harbour facility” constitutes a Nationally Significant Infrastructure Project as identified in s14(1)(j) and under Part 3, s24(2) and s24(3)(c) of the Planning Act 2008 (hereafter ‘the PA2008’) (Ref 1-2) as it comprises:

i. “*The alteration of harbour facilities” (i.e. the existing Port of Immingham) – s24(2);*

ii. “The harbour facilities are in England” – s24(2)(a); and

iii. “The effect of the 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” – s24(2)(b); where

iv. *“The relevant quantity is… in the case of facilities for cargo ships, 5 million tonnes” – s24(3)(c)*.

1.6.5 The jetty and topside infrastructure (including the associated pipework on the jetty) would comprise the NSIP (i.e. the principal development). The pipeline and site areas for the transfer, storage of the ammonia and the hydrogen production, storage and distribution would comprise “associated development” for the purpose of section 115 of the PA2008 (Ref 1-2).

Development Consent Order Application

1.6.6 The Applicant intends to make an application for a Development Consent Order (DCO) to the Planning Inspectorate (the Inspectorate) for the Project.

1.6.7 The DCO Order Limits will include all works proposed as part of the DCO application, including those comprising the NSIP itself and the associated development (as defined by Section 115 of the PA2008 (Ref 1-2) and the accompanying *Guidance on associated development applications for major infrastructure projects* document) (Ref 1-3).

1.6.8 The Inspectorate will examine the DCO application and make a recommendation to the SoS who will decide on whether development consent for the Project should be granted or refused.

1.7 Environmental Impact Assessment and the Purpose of the Preliminary Environmental Information Report

The Need for an Environmental Impact Assessment

1.7.1 The Project is subject to mandatory Environmental Impact Assessment (EIA) procedures, as set out within paragraph 8(2) of Schedule 1 of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (Ref 1-4) (hereafter 'the EIA Regulations'), as it comprises '*Trading ports, piers for loading and unloading connected to land and outside ports (excluding ferry piers) which can take vessels of over 1,350 tonnes*'.

The EIA Scoping Process

1.7.2 The purpose of the EIA Scoping process is to determine which topics should be included in the EIA, and the level of detail to which they should be assessed. An EIA Scoping Report and a request for an EIA Scoping Opinion pursuant to Regulation 10 of the EIA Regulations was submitted to the Inspectorate on behalf of the SoS on 30 August 2022.

1.7.3 The EIA Scoping Report (**Appendix 1.A** of PEI Report, Volume IV) was developed with reference to standard guidance and best practice and was informed by the EIA team's experience of working on a number of similar projects.

1.7.4 The EIA Scoping Report set out:

a. A summary of the Project and the alternatives considered during its development to date.

b. The Applicant's proposed scope of work and methodologies to be applied in carrying out the EIA.

c. The content of the ES and the anticipated likely significant environmental effects that will be identified through the EIA.

1.7.5 The Secretary of State's Scoping Opinion was received by the Applicant on 10 October 2022 and is presented within **Appendix 1.B** of PEI Report, Volume IV. The matters raised have been reviewed and have been taken into consideration

in the relevant technical assessments within the PEI Report, in line with Regulation 14(3)(a) of the EIA Regulations, as described in **Appendix 1.C** of PEI Report, Volume IV. Further details on the EIA Scoping Opinion are set out in **Chapter 5: EIA Approach**.

The PEI Report

1.7.6 The PEI Report which has been prepared to satisfy the requirements of Regulation 12(2) of the EIA Regulations. In accordance with Regulation 12(2)(b), the PEI Report presents *"the information referred to in Regulation 14(2) which has been compiled by the applicant and is reasonably required for the consultation bodies to develop an informed view of the likely significant environmental effects of the development (and of any associated development)."* Regulation 14(2) describes the information to be provided in an ES.

1.7.7 PINS Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements (Ref 1-5) states: "*A good PEI document is one that enables consultees (both specialist and non-specialist) to understand the likely environmental effects of the Proposed Development and helps to inform their consultation responses on the Proposed Development during the pre-application stage*."

1.7.8 The PEI Report is a 'point in time' report, which has been prepared to inform consultation with the public and other stakeholders about the Project and is, based on the ongoing EIA workstream and on the environmental information available at the time of consultation. The Secretary of State's Scoping Opinion was published on 10th October 2022 and the ongoing EIA is being undertaken in accordance with that Opinion.

1.7.9 This PEI Report presents preliminary findings of the environmental assessments undertaken to date. This allows consultees to understand the likely significant effects of the Project and Associated Development and provides them with the opportunity to provide informed comment on the Project, the assessment process and preliminary findings on the likely significant effects of the Project and the Associated Development prior to the finalisation of the DCO Application and the ES. The Applicant is seeking the views of consultees on the information contained within this report, and there is opportunity within the process up to submission of the DCO application for both the EIA and the project design to have regard to comments received as required by Section 49 of the PA2008.

1.7.10 It should be noted that this PEI Report does not constitute a full ES, but rather presents the findings of the EIA process to date. It is considered that this PEI Report presents sufficient preliminary environmental information to enable consultees to develop an informed view of the Project.

1.7.11 **Table 1.1** identifies where the information defined by Regulation 14(2) can be found within this PEI Report.

Table 1.1 Location of information required by Regulation 14(2) within this PEI Report

Specified Information	Location Within PEI Report
A description of the Project comprising information on the site, design, size and other relevant features of the development	Chapter 2: The Project
A description of the likely significant effects of the Project on the environment	Chapters 6 to 25
A description of any features of the Project, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment	Chapters 6 to 25
A description of the reasonable alternatives studied by the Applicant, which are relevant to the Project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment	Chapter 3: Need and Alternatives
A non-technical summary of the information referred to in sub-paragraphs (a) to (d)	Non-Technical Summary (PEI Report Volume I)
Any additional information specified in Schedule 4 relevant to the specific characteristics of the particular development or type of development and to the environmental features likely to be significantly affected	Chapters 6 to 25

1.7.12 Following statutory consultation the ES will be prepared, taking into consideration comments raised during the consultation on the PEI Report. The ES will be submitted as part of the suite of DCO Application materials.

1.7.13 A list of abbreviations and a glossary of terms is provided in **Appendix 1.D** of PEI Report Volume IV.

1.8 Consultation

1.8.1 Consultation is integral to the preparation of DCO applications and to the EIA process. The views of consulted parties and the local community serve to focus the environmental studies undertaken to inform the EIA and to identify specific issues that require further investigation, as well as to inform the design of the Project. Consultation is an ongoing process up to submission of the DCO application and the publication of this PEI Report forms an important part of that process.

1.8.2 The PA2008 requires applicants for development consent to undertake formal pre-application consultation on their (referred to as “statutory consultation”) proposals. There are a number of requirements as to how this consultation must be undertaken that are set out in the Act and related regulations, including:

a. Section 42 requires the Applicant to consult with 'prescribed persons,' which includes certain prescribed consultation bodies such as the Environment Agency and Natural England, relevant statutory undertakers, the Marine Management Organisation, relevant local authorities, and those with an interest in the land affected by the Project.

b. Section 46 requires the Applicant to notify the Secretary of the State of the proposed application.

c. Section 47 requires the Applicant to consult with the local community on the development. Prior to this, the applicant must prepare a Statement of Community Consultation (SoCC) and consult relevant local authorities on its contents. The SoCC must set out the proposed community consultation and, once finalised, a SoCC notice must be published in local newspapers circulating within the vicinity of the land in question in order to ensure that stakeholders are aware of the approach which the applicant will use for the consultation process. The consultation must then be undertaken in accordance with the final SoCC.

d. Section 48 places a duty on the Applicant to publicise the proposed application in the 'prescribed manner' in a national newspaper, The London Gazette, local newspapers circulating within the vicinity of the land and certain marine publications.

e. Section 49 places a duty on the Applicant to take account of any relevant responses received to the consultation and publicity that is required by Sections 42, 47 and 48.

1.8.3 As required under Regulation 12 of the EIA Regulations, the SoCC must also set out how the PEI Report will be consulted on.

1.8.4 The Applicant is running a statutory consultation for the Project over a six week period (42 days inclusive) starting on Monday 9 January 2023 and concluding at 23.59 on Sunday 19 February 2023.

1.8.5 During the statutory consultation, information on all key aspects of the Project will be provided including:

a. Design and layout.

b. The construction and operation of the required marine infrastructure.

c. The construction and operation of the landside works including the hydrogen production facility.

d. Traffic and access arrangements.

e. Environmental impacts on sensitive receptors from effects such as noise and vibration, air quality, ecology, landscape, archaeology, water use and ground contamination.

f. How those impacts are proposed to be controlled minimised or mitigated.

g. The need for the project and alternative sites, technologies and layouts considered for the Project and the reasons for the option selected.

1.8.6 A number of face-to-face consultation/exhibition events in Immingham will be held during the Statutory Consultation where the project team will be available to discuss the Project. Exhibition dates have been chosen so that they cover a range of days and times from week to week throughout the Statutory Consultation, in order to be flexible enough for people to attend at a time that suits their own schedule.

1.8.7 In addition, a range of online mechanisms will be used so that local communities will have access to appropriate information and opportunities to provide feedback without the need to meet in person. This approach, alongside the use of fully accessible, well known and centrally located venues within the local community, will reduce barriers to participation and give people a range of opportunities to engage with the consultation.

1.8.8 The issues that are raised through consultation, and how these have been considered and addressed within the design evolution of the Project and the EIA, will be set out in a Consultation Report. The Consultation Report will be submitted as part of the application for development consent and will include a separate section on EIA related consultation as recommended within *PINS Advice Note Fourteen: Compiling the Consultation Report* (Ref 1-6).

1.9 Structure of this PEI Report

1.9.1 The structure of this PEI Report reflects the proposed format of the final ES and covers the assessment topics agreed through the EIA Scoping process.

1.9.2 The PEI Report is set out in four separate volumes:

a. Volume I comprises of a Non-Technical Summary (NTS), which is a summary of the main document.

b. Volume II of the PEI Report is main document and is structured into chapters, as follows:

c. Chapter 1: Introduction – an introduction to the PEI Report.

d. Chapter 2: The Project – an overview of the Project and the Site.

e. Chapter 3: Need and Alternatives – an explanation as to the identified need for the Project together with a preliminary summary of the possible alternatives.

f. Chapter 4: Legislative and Consenting Framework – an overview of the information requirements associated with key legislation and policy of relevance to the Project.

g. Chapter 5: EIA Approach - sets out the key issues identified during consultation and the scoping phase of the EIA, as well as presenting the overarching impact assessment methodology.

h. Chapters 6 to 24 – preliminary assessments of the likely significant effects of the Project in relation to the environmental topics scoped into the EIA.

i. Chapter 25: Cumulative and In-combination Effects – explains the process that is being followed in respect of the consideration of cumulative and in combination effects.

j. Chapter 26: Summary – a summary of the key findings of the PEI Report, including the potential impacts and mitigation measures that would avoid or reduce potential impacts of the Project.

k. Volume III of the PEI Report contains the figures which support the chapters in Volume II.

l. Volume IV of the PEI Report contains the appendices which support the chapters in Volume II.

1.10 Statement of Competence

1.10.1 As required under Regulation 14(4)(b) of the EIA Regulations, an ES must be accompanied by a statement outlining the relevant expertise or qualifications of those involved in its preparation. A statement of competence of the EIA coordinators and the technical specialists that have provided expert input to the PEI Report is included as **Appendix 1.E** of PEI Report, Volume IV.

1.11 References

Ref 1-1 UK Government (2022). British Energy Security Strategy Policy Paper.

Ref 1-2 UK Government (2008). Planning Act *2008*.

Ref 1-3 Department for Communities and Local Government (2013). Planning Act 2008: Guidance on Associated Development Applications for Major Infrastructure Projects.

Ref 1-4 The Stationery Office Limited (2017). The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

Ref 1-5 The Planning Inspectorate (2020). Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements (Version 7).

Ref 1-6 The Planning Inspectorate (2021). Advice Note Fourteen: Compiling the Consultation Report (Version 3).

1.12 Abbreviations and Glossary of Terms

Table 1.2 Abbreviations and Glossary of terms

Term	Acronym	Meaning
Air Products BR Ltd	AP	A world-leading industrial gases company that develops, engineers, builds, owns and operates some of the world's largest industrial gas projects.
Associated British Ports	ABP	One of the UK's leading and best-connected ports groups, owning and operating 21 ports across England, Wales and Scotland.
Department for Transport	DfT	The Government department responsible for policy and regulations on transport issues.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified, addressed and reported and taken into account in decision making
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
Heavy Goods Vehicle	HGV	A large truck for transporting goods.
Humber International Terminal	HIT	A terminal located within the Port of Immingham.
Nationally Significant Infrastructure Project	NSIP	A type of project listed in the Planning Act 2008, which must be consented by a Development Consent Order.
Non-Technical Summary	NTS	This section of the Environmental Statement provides a summary of each document that makes up the Environmental Statement.
North East Lincolnshire Council	NELC	The Local Planning Authority
Planning Inspectorate	PINS	An executive agency with responsibilities for planning appeals, national infrastructure planning applications, local plan examinations and other planning-related casework in England and Wales.
Preliminary Environmental Information	PEI	This document is the PEI Report which has been prepared to satisfy the requirements of Regulation 12(2) of the EIA Regulations. In accordance with Regulation 12(2)(b), the PEI Report presents *"the information referred to in Regulation 14(2) which has been compiled*

Term	Acronym	Meaning
		by the applicant and is reasonably required for the consultation bodies to develop an informed view of the likely significant environmental effects of the development (and of any associated development).” Regulation 14(2) describes the information to be provided in an ES.
Statement of Community Consultation	SoCC	This document sets out how the Applicant will be consulting people living in the vicinity of the Project.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 2: The Project

Associated British Ports

Document History

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Table of contents

Tables

2 The Project

2.1 Overview of the Project

2.1.1 The Project would comprise the construction, operation and maintenance of a terminal to facilitate the import and export of bulk liquids associated with the energy sector, together with associated development. The terminal consists of a jetty and associated loading/ unloading infrastructure, pipelines and metering systems.

2.1.2 Initially, the terminal would be used for the import and export of green ammonia to be converted to green hydrogen. To facilitate this, a hydrogen production facility, comprising associated ammonia handling equipment, storage and processing units would be constructed as part of the Project. Other proposed uses for the green energy terminal will come forward in due course as separate applications. It is anticipated that future users are likely to include customers in the carbon capture sector.

2.2 Purpose and Objectives

2.2.1 The objectives of the Project are:

a. To provide essential port infrastructure, capacity and resilience to support the growth and changing strategic needs of the energy sector to support decarbonisation within the Humber Industrial Cluster and the Humber Enterprise Zone.

b. To provide capacity to support the import and export of a range of bulk liquid energy products including (i) ammonia (NH_3) (to produce green hydrogen) to help decarbonise the United Kingdom's (UK) transport sector and (ii) carbon dioxide (CO_2) to facilitate carbon capture and storage, both of which will assist transition towards net zero.

c. To deliver and operate new port infrastructure, and its first user's hydrogen production facility, in a safe, efficient and sustainable manner by making effective use of available land, water, transport and utility connections which exist in and around the Port of Immingham.

d. To minimise adverse impacts on the environment and safeguard the health, safety and amenity of local residents.

e. To enhance both the local and regional economy through direct investment in and around the Port of Immingham and by partnering with the supply chain, providing opportunities for training, upskilling, apprenticeships and local employment.

2.2.2 An overview of the green hydrogen production process is provided in **Appendix 2.A** (PEI Report, Volume IV).

2.3 Project Site Description

2.3.1 The following sections describe the location, nearest sensitive receptors, features and elements associated with the Project Site (the 'Site') and the surrounding environment as illustrated on **Figure 2.1** (PEI Report, Volume III).

Project Location

2.3.2 The Site is located in North East Lincolnshire on the south bank of the Humber Estuary to the east of the Port. **Figure 1.1** (PEI Report, Volume III) illustrates the Project's location, which is approximately centred on National Grid Reference (NGR) E520783 N415271.

2.3.3 The land-side works fall within the administrative boundary of North East Lincolnshire Council (NELC), as illustrated on **Figure 2.2** (PEI Report, Volume III). The marine-side works, that extend seaward and fall beyond the local authority's boundary, will take place in the bed of the Humber Estuary, which is owned by the Crown Estate and over which the Applicant has the benefit of a long lease. The Project in its entirety covers an area of approximately 170.41 ha.

Parts of the Site

2.3.4 As illustrated on **Figure 2.3** (PEI Report, Volume III), the Project Site is split up into the following areas:

a. Terminal comprising a jetty and topside infrastructure;

b. Corridor between the jetty and Laporte Road to support a jetty access road, the ammonia import pipeline to the East site (and a reserved corridor for a future pipeline);

c. East Site on which the ammonia storage and hydrogen production will be undertaken;

d. West Site, where hydrogen production, storage and loading will be undertaken;

e. Pipeline corridor between the East and West Sites for the transfer of ammonia, hydrogen, nitrogen and utilities; and

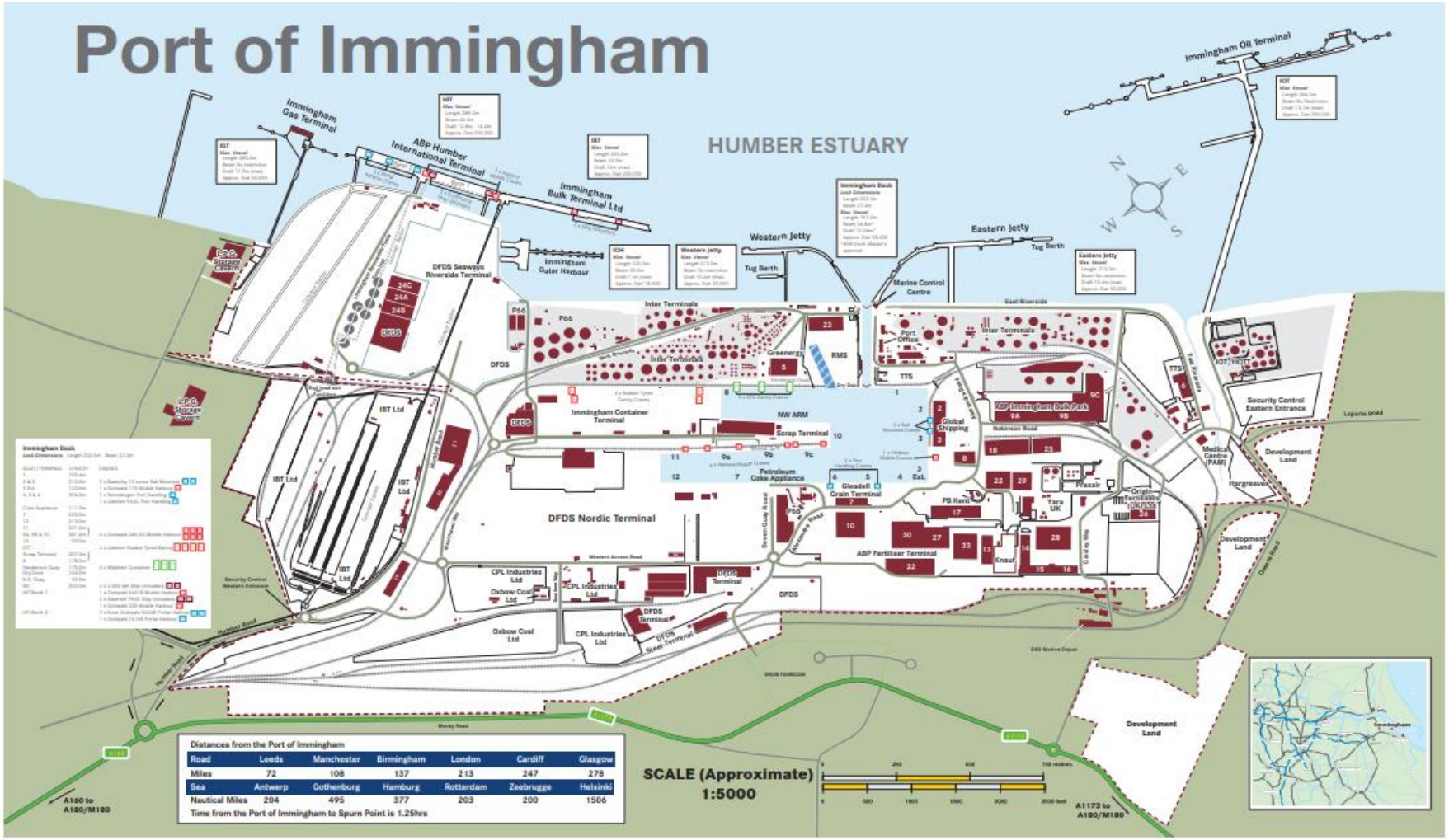
f. Temporary Construction Areas for laydown and construction compounds.

2.3.5 The Site is situated to the east of the Port and largely outside of the operational area of the Port, as shown in **Plate 2-1**. The area surrounding the Port is industrial in nature, being dominated by chemical manufacturing, oil processing and power generation facilities. Residential and commercial properties are present to the south of the Port on Queens Road and lie within, and adjacent to, the Site boundary. Beyond the industrial facilities, the wider area is largely agricultural. The nearest residential area is the town of Immingham approximately 1km from the western edge of the West Site.

2.3.6 The Port lies immediately adjacent to the main deep-water shipping channel which serves the Humber Estuary, thereby enabling access to the Port by some of the largest vessels afloat today. The Port is also well located for onward/inward transport of goods by road throughout the UK. It enjoys easy and

quick access for road haulage to the M180 Motorway and from there to the M1 Motorway or the A1, via the M18 Motorway. In addition, the Port has its own rail terminal, with some 25% of all rail freight in the UK originating from the Port. This primarily connects to local power stations and steel works moving circa 10 million tonnes of cargo per annum.

Plate 2-1 Plan of the Port of Immingham



Site History

2.3.7 Available historical maps from the Groundsure Report (Ref 2-1) for the Site have been studied to determine the previous land uses within the area surrounding the Project Site boundary. The mapping shows no notable development on the Site until 1930–31 when residential housing is shown on Queens Road adjacent to the West Site boundary. In addition, the L.N.E.R Grimsby District Electric Light Railway is shown through the centre of the proposed pipeline route. Within 500m of the Site boundary, a sewage works was also located.

2.3.8 No notable changes occur at the Site until 1951–56. At this time a Gypsum Disposal Bed is denoted partially on the West Site boundary and extends off-site to the southeast. In addition, the Railway is no longer shown in the proposed pipeline route. Buildings and railway lines associated with a Chemical Factory are denoted approximately 350m southeast from the northeast Temporary Construction Area.

2.3.9 In 1964, small buildings are denoted on the West Site, whilst electricity lines run through the East Site. At this time the Port begins to develop, including but not limited to the development of two jetties 235m north and 428m east from the Site boundary respectively, as well as an electricity sub-station. The Chemical Factory is denoted on the map as a 'Works' from 1964 onwards.

2.3.10 Up to the present day, no notable change has occurred within the Site aside from further electricity pylons being denoted through the West Site and a pipeline being denoted on the northwest site boundary in 1969–72. 500m from the Site boundary multiple changes occur between 1964 and the present day and the industrial landscape continues to build-up including but not limited to an Oil Storage Depot and associated infrastructure, structures associated with the sewage works, pipelines, and most recently in 2010 a Recycling Centre which is no longer shown in the 2022 map of the Project and surrounding area.

2.3.11 The 'Works', multiple railway lines and other infrastructure all become disused during the time between 1969 – present day. Despite this some infrastructure has remained, such as the jetties that were denoted on maps from 1964.

Existing Environment and Land Use

2.3.12 The proposed Terminal would extend seawards into the Humber Estuary and the Site is located to the east of the existing Immingham Oil Terminal jetty. This area falls within the boundaries of the Humber Estuary Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar Site, which collectively form the Humber European Marine Site (EMS).

2.3.13 The East Site comprises two parcels of land, which are bisected by Laporte Road. The first parcel of land consists of an area of hardstanding to the north of Laporte Road which is in use by the Applicant as a storage area. The second parcel of land is a triangular shaped area of brownfield land that is currently covered by gravel and various stockpiles, which is accessed via Queens Road (A1173) and lies to the south of Laporte Road. The Associated Petroleum Terminals works complex is situated to the north/north-east of the East Site, whilst to the south are various industrial facilities. To the west and north-west is

the Port and associated industrial facilities and the 'Immingham Dock East Gate' Port entry point from Queens Road. To the east the East Site is bordered by a woodland belt which is subject to a Tree Preservation Order (TPO), and through which a bridleway passes, connecting users to a coastal access path that follows the Humber Estuary east to Grimsby.

2.3.14 The West Site currently comprises three agricultural fields, which are bounded by linear hedgerows and drainage ditches. An electrical sub-station and a gas-fired power generator installation are situated to the north-west. The north west and western boundaries of the West Site are defined by Kings Road and the A1173. A landfill is located to the south separated by a landscape buffer strip. Queens Road forms the north-eastern boundary of the West Site with a number of residential and commercial properties included within the Site boundary. The east and south-eastern boundary is adjacent to another gas fired power generator installation, the community recycling centre and a large waste gypsum landfill. A short tarmac access road has been constructed from Kings Road into the West Site and a series of overhead power cables run across the middle and southern boundary of the site, with a buried mains water and a buried high-pressure gas pipeline also along the southern boundary. A proposed Pipeline Corridor connects the West Site to the East Site and extends to the Terminal. It crosses an area that has mostly already been impacted by industrial development alongside Queens Road and Laporte Road, and also crosses the Grimsby Docks Branch Line. At the eastern end, the Pipeline Corridor area includes a section of woodland known as 'Long Strip' between Laporte Road and the Humber Estuary that is subject to a Tree Preservation Order (TPO).

Utilities

2.3.15 Underground gas mains, water mains and overhead electricity transmission infrastructure cross the Site.

Potential Sensitivities / Receptors in the vicinity of the Site

Air Quality Receptors

2.3.16 There are no Air Quality Management Areas (AQMA) within the Site or surrounding area. Immingham itself has historically had an AQMA, close to the Port on Kings Road, due to elevated concentrations of PM_{10} concentrations that are now well below the relevant air quality objectives.

Ecological Receptors

2.3.17 The Site falls within boundary of the Humber Estuary EMS, which is a statutory designated site that encompasses the Humber Estuary SPA, SAC, RAMSAR and Site of Special Scientific Interest (SSSI) designations.

2.3.18 Laporte Road Brownfield Site Local Wildlife Site (LWS) is located approximately 150m south-east of the Site.

2.3.19 The mature broad-leaved deciduous woodland of Long Strip is within a corridor between the jetty and Laporte Road which is required to support a jetty access road, the ammonia import pipeline to the East Site (and a reserved corridor for a future pipeline). This area is subject to a TPO which applies to the whole

woodland block (including the area on the south side of Laporte Road, which is outside the Site boundary) as shown on **Figure 2.1** (PEI Report, Volume III).

Traffic and Transport Receptors

2.3.20 Access to the West Site would be using an existing access off Kings Road and a new access onto the A1173. Access to the East Site would be off Queens Road and Laporte Road. Further details are provided in **Section 2.4** below. Queens Road is a single carriageway road providing a link from the Port Area, crossing the Grimsby Docks Branch Line on a bridge and runs towards the A1173, where it becomes Kings Road. Kings Road is also a single carriageway, which forms a three-arm roundabout junction with the A1173, where Kings Road then continues to the north to form a link into Immingham and then to the A160 to the north. The A160 heads west and connects with the A180. A new permanent access point will also be required off Laporte Road for a Jetty Access Road (see **Section 2.4** and **Section 2.7** below). Temporary access points would be required during construction including one for the main Temporary Construction Area, accessed off Laporte Road.

2.3.21 From the three-arm roundabout junction with Kings Road, the A1173 continues south as a single carriageway to form a three-arm roundabout with Kiln Lane before continuing south to form a grade separated junction with the A180. The A180 is part of the strategic road network (SRN) and is maintained by National Highways. The A180 heads east to Grimsby and west towards the closest motorway (M180) and provides the link from the local area to the wider highway network within the region.

2.3.22 There is a bridleway/ Public Right of Way (PRoW) within the Site, which runs through the eastern edge of the strip of woodland described above at **paragraph 2.3.13** and which forms part of the proposed route for the improvements to the England Coast Path between the Humber Bridge and Easington (to the north of the Humber) and Mablethorpe to Humber Bridge (to the South of the Humber). Part of the proposed upgraded route is located within the Site. Pedestrian facilities are limited on the local road network in the vicinity of the Site, with a footway along one side of Queens Road and along the north side of the A1173 King Road providing a link into Immingham. It is anticipated that the bridleway would need to be temporarily diverted or closed during the construction phase of the Project but would be re-opened in the operational phase. This is considered in detail in **Chapter 23: Socio-economics**.

Residential Receptors

2.3.23 The nearest settlement is the town of Immingham, which is located approximately 460m west of the Site at its closest point.

2.3.24 Other settlements nearby include: Grimsby (approximately 5km) to the south-east; Healing (approximately 3.5km) and Great Coates (approximately 5.5km) to the south-east; Stallingborough (approximately 2.5km) to the south; Keelby (approximately 5km) to the south-west and Habrough (approximately 4.5km) to the west.

2.3.25 The closest residential receptors to the Site include:

a. Seven residential properties located on the west side of Queens Road (1-6 and 31 Queens Road) which are included within the Site boundary. These have been included within the Site as their continued residential use is unlikely to be compatible with the operation of the hydrogen production facility and storage on the West Site (see **Section 2.4** below and **Chapter 22: Major and Accidents and Disasters** for further information).

b. A large number of residential properties on the eastern edge of the Immingham residential urban area including Somerton Road, Dunster Walk, Ings Lane, Oakham Walk, Kendal Road, Chestnut Avenue, Waterworks Street and Spring Street, which at the closest point are located between approximately 460m and 480m west of the West Site.

c. Mauxhall Farm off Stallingborough Road, approximately 1km south-west of the West Site.

Business / commercial receptors

2.3.26 The Site also includes a number of business / commercial receptors comprising (so far as is known from investigations to date, with potential additions to be determined):

1. Sherwood Travel (Coach and minibus hire);
2. Queens Road Café;
3. Mark Ellis Motor Services (Mechanic);
4. European Welding Supplies Limited (Welding Supply shop);
5. Saybolt UK Ltd (Marine Surveyor); and
6. P&H insulation Services.

2.3.27 These have been included within the Site because, whilst it is considered possible that their continued use will be compatible with the operation of the hydrogen production facility, this requires further assessment which will be undertaken in connection with the application for Hazardous Substances Consent.

Consultation with owners and occupiers

2.3.28 Discussions with the owners and occupiers of the residential and commercial properties have commenced.

2.3.29 Air Products is currently in discussions with the landowners / occupiers of the seven residential properties with a view to negotiating their acquisition. Where it is not possible to acquire those properties through negotiation, acquisition powers for these properties will be sought through the Development Consent Order (DCO).

2.3.30 Whilst it is possible that powers to compulsorily acquire the commercial properties or undertake appropriate works may be sought as part of the DCO, this is currently considered unlikely.

Cultural Heritage Receptors

2.3.31 There are no World Heritage Sites, Scheduled Monuments, Grade I and II* listed buildings, conservation areas, registered parks and gardens, registered

battlefields, or protected wreck sites within 2km of the Site. There are a total of three Grade II listed buildings located within 2km of the Site, comprising of the Immingham War Memorial (NHLE 1455139), Churchfield Manor (NHLE 1161630) and the Iron Bungalow (NHLE 1391349).

Landscape and Visual Receptors

2.3.32 The existing landscape / seascape and visual baseline is heavily influenced by the existing industrial presence located around the deep-water-port. This includes several deep-water jetties for bulk cargo and terminals for oil and gas; the area is dominated by industrial works. The seascape of the Humber varies in quality and character along its length, with expansive areas of tidal mudflats and saltmarsh contrasting with more developed industrial areas. Visual receptors are relatively limited, with the main concentration being residents in the nearby settlement of Immingham. Existing views from most locations include the structures and infrastructure associated with the working port and other adjacent industrial development.

2.3.33 Part of the Site and landscape and visual study area fall within The Humber Estuary National Character Area (NCA). The character area is broadly split into two components, the largest being the expanse of water associated with the Humber Estuary, which discharges into the North Sea. Due to its strategic position, the estuary facilitates important and busy trade routes. The land adjacent to the coast is described as a *'low-lying estuarine landscape with extensive stretches of intertidal habitats'*. Due to these elements, the landscape has international significance as a Ramsar site, along with several other designations. The character area provides a varied landscape, with open and extensive views across remote and rural areas, contrasting with heavy industry associated with towns and ports.

2.3.34 The Site lies within Marine Character Area (MCA) 6: Humber Water, which is the second largest coastal plain estuary in the UK and is bound by intertidal mud and sand flats and saltmarsh. These habitats provide internationally important wildlife corridors. The character area contains the UK's largest port complex and views are dominated with an extensive and complex mix of industrial, commercial, agricultural, residential and tourism land uses. Shipping traffic using the local ports provide a dominant animated feature.

2.3.35 The Site is located within Regional Character Area (RCA) 3: The Northern Marshes, which is defined by the industrial features along the coast clustered around the deep-water Port of Immingham. The RCA is visually dominated by large and tall structures, such as Lindsay Oil Refinery, which are linked with the Port and heavy industry.

2.3.36 The Site is also within Local Landscape Character Area (LCA) A – Humber Estuary, as defined by the NELC Landscape Character Assessment (Ref 2-2). Area A – Humber Estuary is then subdivided into three Local Landscape Types (LLTs), which the Site and study area lie within:

a. LLT 1 Industrial Landscape;

b. LLT 2 Open Farmland; and

c. LLT3 Wooded Open Farmland.

Topography, Land Quality and Geological Receptors

2.3.37 The topography of the Site is low-lying and flat with many areas existing as historically reclaimed land. An extensive network of ditches artificially drains the land.

2.3.38 The Provisional Agricultural Land Classification Grade Map on MAGIC Map Application (Ref 2-3) indicates that the East Site and Pipeline are designated as Grade Urban, whilst most of the West Site is designated as Grade 3 but has not been subdivided into Grades 3a or 3b. The eastern half of the Temporary Construction Area adjacent to the Humber Estuary has also been designated as Grade 3 but has not been subdivided into Grades 3a and 3b, and the western half is designated as Grade Urban.

2.3.39 The solid geology across the entire Site is characterised by the Flamborough Chalk Formation. There are superficial deposits comprising Beach and Tidal Flat Deposits and Tidal Flat Deposits associated with the Humber Estuary. Made Ground is anticipated to be presented across the majority of the Site.

Hydrological and Flood Risk Receptors

2.3.40 The Humber Estuary forms the eastern boundary of the Site. North Beck Drain, Middle Drain and Habrough Marsh Drain are all located in the vicinity of the Site as shown in **Figure 18.1** (PEI Report, Volume III).

2.3.41 The Environment Agency Flood Map for Planning shows that Site is located entirely in Flood Zone 3. However, the Site is afforded protection from tidal flood defences that are in place along the entire south bank of the Humber Estuary. These tidal flood defences provide protection against a flood event with a 0.5% chance of occurring in any year, therefore the likelihood of a flood event occurring from overtopping or failure of the defences is considered to be low due to the presence of flood defences.

2.3.42 There are no historical flood records from groundwater flooding within the Site or the wider Port of Immingham area and the Site is also at very low to low risk of flooding from surface water sources.

2.3.43 Anglian Water asset mapping shows that there is no surface water drainage infrastructure operated by them within the Site. An Anglian Water foul sewer main and the Immingham Sea Outfall are located in proximity to the Site. Surface water from hard standing areas is generally discharged directly to the adjacent watercourses and ultimately to the Humber Estuary, or directly to the Humber Estuary.

2.3.44 Given the generally undeveloped nature of the Site, it is assumed that the land predominantly drains via natural infiltration processes to the land drains located within and adjacent to the Site. There is a possibility that historical drainage infrastructure is present beneath the East Site, however it is not known whether this part of the Site drains via natural processes or via a piped system.

2.4 Project Description

2.4.1 The design of the Project at this stage incorporates a degree of flexibility in the dimensions and configurations of buildings and structures to allow for the future selection of the preferred technology and contractor.

2.4.2 In order to ensure a robust assessment of the likely significant environmental effects of the Project, the Environmental Impact Assessment (EIA) is being undertaken adopting the principles of the 'Rochdale Envelope' approach where appropriate. This involves assessing the maximum (or where relevant, minimum) parameters for the elements where flexibility needs to be retained (building dimensions or operational modes for example). Where this approach is being applied to the specific aspects of the EIA, this is confirmed within the relevant chapters of this Preliminary Environmental Information (PEI) Report. This PEI Report is considered to represent a reasonable worst-case assessment of the potential impacts of the Project at its current stage of design.

Project Components

2.4.1 In summary, the Project would comprise:

a. On the marine side (the Nationally Significant Infrastructure project (NSIP)):
   i. A jetty, consisting of an approach trestle, approximately 1.1km in length, leading to up to two berths, including loading platforms and berthing and mooring dolphins with link walkways; and
   ii. Topside infrastructure on the jetty for the handling of bulk liquids, including loading arms and pipelines.

b. On the land side (the Associated Development):
   i. An access road to the jetty;
   ii. Two operational sites supporting hydrogen production facilities (an East Site and a West Site);
   iii. Pipework, pipelines and utilities (i) between the jetty and the green hydrogen production facility on the East Site and (ii) between the two green hydrogen production facility sites and (iii) between buildings and plant within the production operation facilities;
   iv. Refrigerated ammonia storage tank (on the East Site);
   v. Hydrogen production units that convert ammonia to produce the green hydrogen (on both East and West Sites);
   vi. Hydrogen liquefiers (on both East and West Sites) to liquify the hydrogen for temporary storage (on the West Site);
   vii. Loading bays to fill road tankers with liquified hydrogen which would then be distributed to hydrogen filling stations throughout the UK (on the West Site);
   viii. Ancillary buildings and works;
   ix. Access from the public highway to the two hydrogen production sites; and

x. Temporary construction areas.

2.4.2 Further details on these elements of the project are provided below as relevant.

2.4.3 **Figure 2.4** (PEI Report, Volume III) provides a site layout of the Project, which is provided for illustrative purposes only. The assessment undertaken to inform the EIA will be based on the parameters set out below and as indicated within individual topic chapters.

Marine Infrastructure (the NSIP or principal development)

Terminal

2.4.4 This would be a new jetty located to the east of the existing Immingham Oil Terminal jetty. A new in-river jetty with up to two berths, including topside infrastructure, is proposed that would have capacity to facilitate the import and export of bulk liquids associated with energy. Between them, the two berths would be capable of handling a variety of large vessels, of between 100m-250m in length and with draughts of up to 14m. The associated hydrogen production facility, to be operated by Air Products and described below, would be the first user of the jetty facility for the import of green ammonia to be converted to green hydrogen. The other bulk liquids are expected to include products such as liquefied CO_2 for the purpose of carbon capture and storage including via connection to proposed CO_2 transport infrastructure being developed close to the Port.

2.4.5 The proposed marine infrastructure would consist of:

a. An open piled approach trestle, approximately 1.1km in length, which would extend from the river frontage in a northerly direction leading to the jetty structures and which would provide access for vehicles and pipework to and from the shore to the berths. The approach trestle would be approximately 13m in width connecting to a jetty head of approximately 50m by 20m to provide the western berth (Berth 1). A jetty arm of up to 525m would connect to a second platform of approximately 50m by 20m to provide the berth (Berth 2). The jetty will involve the installation of approximately 380 steel tubular piles, which are estimated to be a maximum of 1,372 mm diameter in size.

b. Each jetty head would comprise structures including (un)loading platforms, two berthing dolphins with fenders and mooring dolphins (likely 12) linked by high level walkways to facilitate operational and maintenance access. The western berth (Berth 1) would support the largest vessels (with draught to 14m and with capacity of up to 55,000 tonnes) and the eastern berth (Berth 2) would support smaller vessels (with capacity of up to 25,000 tonnes).

c. Appropriate topside infrastructure installed on the jetty to load and unload vessels including marine loading arms, piping, maintenance access, wastewater collection and drainage and supporting utilities for handling liquid bulk shipments. The pipework would run along the jetty, over the existing seawall, to a connection point with the landside pipework.

d. A small capital dredge of approximately 100,000m^3 (based on the latest available site-specific geotechnical and geophysical information) would be

required to ensure accessibility and safe mooring for vessels on the western berth (Berth 1) at all states of the tide. It is envisaged that the required dredge depth would be approximately 16m below Chart Datum; however, this would be confirmed through the Project design process and further information will be provided in the ES. No capital dredging is expected to be required for the eastern berth (Berth 2).

e. Any dredge berth pocket would be optimised to include side slopes to ensure its stability, and it is envisaged that the dredged arisings (comprising of alluvial and glacial materials) if not suitable for beneficial reuse, would be disposed at licensed sites within the estuary as described in **Section 2.6** below.

f. Periodic maintenance dredging may be required and a reasonable worst case maintenance dredging scenario, an outline of the assumptions upon which this is based, will be set out in the ES. The implications of maintenance dredging for the marine environment will be assessed in the ES.

Landside Infrastructure (associated development)

2.4.6 The landside infrastructure associated with the Project for which consent is sought under this DCO Application would consist of the infrastructure necessary to import the ammonia from the jetty, store the ammonia and convert that ammonia into green hydrogen at the East and West Sites. The green hydrogen production facility would be the first user of the NSIP. The landside infrastructure would, in summary, consist of:

a. Pipework, pipelines and utilities required to link (i) the jetty and the green hydrogen production operations on the East Site, (ii) the hydrogen production operations on the East and West sites and (iii) buildings and plant within the production operation facilities.

b. A jetty access road connecting Laporte Road to the jetty, providing vehicular access to the jetty and also the ability to maintain the adjacent pipelines between the jetty and the East Site.

c. A control building on the landside, at the foot of the jetty, to accommodate personnel operating the jetty and maintenance vehicles.

d. An ammonia storage tank: the refrigerated liquid ammonia would be stored in a tank, up to 45m in height, at nearly atmospheric pressure at -33°C.

e. Up to six hydrogen production units (three on the East Site and three on the West Site). In the hydrogen production units, the liquid ammonia would be split into hydrogen and nitrogen (N) (nitrogen makes up 78% of the composition of ambient air). The core of the process is a catalytic bed. This reaction is endothermic i.e. it requires heat to take place, so the catalytic bed sits within a furnace, which would be fired using natural gas. The furnace output capacity is estimated to be less than 30MW during the initial phase of development (operation of the first three hydrogen production units) plus a similar output for the future phase (operation of up to six hydrogen production units in total) (see **Section 2.5**). It is anticipated that this process could be

further decarbonised in future by using alternative low carbon fuels, potentially including green or low carbon hydrogen or biomethane.

f. Hydrogen liquefaction (on both East and West sites) and storage facilities (on the West Site): the hydrogen in gaseous form coming from the hydrogen production units would be turned into liquid through a hydrogen liquefier, so it is easier to safely store and transport. The liquid hydrogen would be stored in horizontal storage vessels or tubes with up to 250 tonnes stored on the West Site.

g. Green hydrogen export facilities: road tanker loading bays for both liquid and gaseous hydrogen for distribution to the points of use throughout the UK.

h. The formation of new access roads and junctions into the Site as well as internal access roads around the hydrogen production facilities.

i. Grid connection: the site will be supplied with electricity from the local grid. Work is ongoing to determine the details of this supply. The voltage level of the required supply is most likely to be 132kV and further details will be provided in the ES.

2.4.7 The buildings and structures associated with these elements are described in greater detail below, as relevant.

2.4.8 The Associated Development will comply with the Environmental Permitting (England and Wales) Regulations 2016 (Ref 2-4) (EPR) under an Environmental Permit to be obtained from the Environment Agency as detailed in **Chapter 4: Legislative and Consenting Framework**.

2.4.9 The Site will be operated in line with appropriate standards and the operator will implement and maintain an Environment Management System (EMS) which will be certified to International Standards Organisation (ISO) 14001. The EMS will outline requirements and procedures required to ensure that the Site is operating to the appropriate standard.

2.4.10 Sampling and analysis of pollutants will be carried out where required including monitoring of exhaust emissions levels using continuous emissions monitoring systems CEMS prior to discharge from the stacks, in accordance with the Environmental Permit.

2.4.11 Based on the volumes of hazardous materials to be stored on the Site, a Hazardous Substances Consent will be required from NELC. The hydrogen production facility will also be regulated through the Control of Major Accidents and Hazards Regulations (COMAH) and other legislation identified **in Chapter 22: Major and Accidents and Disasters**. As a result, the implications for land uses around the hydrogen production facility need to be carefully considered (see **Table 22.2 Relevant Legislation, Policy and Best Practice Regarding MA&D**). As mentioned in **Section 2.3** above, it is currently anticipated that the residential use of seven properties on the west side of Queens Road will need to cease as residential use is unlikely to be compatible with the operation of the hydrogen production facility on the West Site. Discussions have commenced with the owners and occupiers to determine whether they wish to dispose of their interests. Where it is not possible to acquire those properties through negotiation, acquisition powers for these properties will be sought through the DCO.

2.4.12 Further, as mentioned in **Section 2.3** above, a number of businesses are also present in the same area on the west side of Queens Road. Further assessment will be undertaken to determine the compatibility of these uses with the Project and discussions with the owners and occupiers have commenced. Whilst it is possible that powers to compulsorily acquire the properties or undertake appropriate works may be sought as part of the DCO, this is currently considered unlikely. The implications of loss of employment as a result of relocation or extinguishment of some of those businesses are assessed in **Chapter 23: Socio-economics** and reference is made to these properties as sensitive receptors in this PEI Report as relevant.

2.4.13 It is the strong preference of both ABP and Air Products to acquire all necessary interests in land for the construction and operation of the Project through negotiation and both parties aim to continue discussions with all affected parties during and after the Statutory Consultation. Any compulsory powers sought within the DCO will be carefully considered and explained by reference to the statutory tests and guidance.

East Site

2.4.14 The East Site would comprise an ammonia storage facility and hydrogen production units for the production of hydrogen from ammonia. Initially only one hydrogen production units would be constructed on the East Site in Phase 1 of the Project, with additional hydrogen production units (up to two) being added in future phases of development to make a total of three on the East Site when fully built out (see **Section 2.5**). One flare would be required per hydrogen production unit, therefore up to three flares would be required on the East Site. Each flare would be fitted with a shroud to minimise visibility of the pilot light. Use of the flares would be exceptional, i.e. for emergency use only and during start up and shut down.

2.4.15 The East Site would be linked to the jetty through the ammonia pipeline as well as communications and utilities links described above. The ammonia pipeline between the East Site and the jetty would be maintained from the Jetty Access Road immediately to the east of it which is described further at **Section 2.7**.

2.4.16 Offloaded refrigerated liquid ammonia from the jetty facility would be transferred to the ammonia storage tank at the East Site. The storage facility would include a refrigeration (boil-off gas) system, storage flare for emergency use only, and supply pumps for the hydrogen production units.

2.4.17 A list of key buildings and structures that would be required on the East Site is set out in **Table 2.1**. This information will continue to be developed through the design process and further details will be presented in the ES. However, these are the maximum dimensions envisaged in order to present a worst case for assessment purposes.

Table 2.1 East Site Key Buildings and Infrastructure – Indicative List

Building / Infrastructure Name	No. of Units (total)	Dimensions		
		Length (m)	Width (m)	Height (m)
Hydrogen production unit main stack	3	2	2	35
Hydrogen production unit	3	95	70	35
Hydrogen production unit flare	3	N/A	5m dia	45
Ammonia tank	1	N/A	70m dia	65**
Ammonia tank flare	1	N/A	1m dia	8
Piperack	1	45	10	15
Control / Security Building	1	40	30	6

** Includes Ammonia Tank flare, placed on top of NH_3 Tank

2.4.18 Access to the East Site from public roads is proposed via two new entrances, one from Queens Road and the other from Laporte Road, and an existing access taken via the Eastern Gateway into the Port. For details on operational traffic estimates see **Chapter 11: Traffic and Transport**.

2.4.19 East site utility / service connections and requirements are detailed in **Table 2.2**.

Table 2.2 East Site Utility / Service Connections

Utility / Service	Connection
Nitrogen	The East Site would receive nitrogen that is generated at the West Site via a connection pipeline in the main pipeline corridor described below.
Natural gas	Natural gas will be supplied from the local main gas network. Connection details are not yet available.
Power	The East Site will be supplied with electricity via a connection to the local grid from the West Site. Work is ongoing to determine the details of this supply. The voltage level of the supply is most likely to be 132kV.
Potable water	A connection to the local water mains network will be made. The local provider is Anglian Water.
Cooling water	A site-wide cooling loop will be required. The source of make-up water is to be confirmed.
Firewater	A firewater system within the site boundary is required, however the source of the firewater is not yet confirmed. At this stage it is assumed that it will be from the potable water source and will require a fire water tank. Care in design would be taken to ensure proper segregation from any drinking or welfare related use. An allowance would be made for the retention of

Utility / Service	Connection
	firewater (contaminated water from firefighting). It is anticipated that this would be a retention basin on site sized for the maximum fire case with allowance for storm conditions. This basin would also be able to act as a hold up for chemical spills and arrangements would be made to sewerage provided to collect spills
Wastewater	A site-wide drainage system would be required for surface run-off and is likely to include attenuation storage to mitigate the impact of introducing impermeable surfaces. The management of wastewater and its disposal from site will be considered during the development of the drainage strategy. Refer to **Chapter 18 Water Quality, Coastal Protection, Flood Risk and Drainage** for further details'

2.4.20 An operational access route to the Jetty will be required from Laporte Road to the jetty. The construction of the jetty access road and installation of the pipeline would lead to tree loss from the TPO area and this is considered in **Chapter 8: Nature Conservation (Terrestrial Ecology)** and **Chapter 13: Landscape and Visual**.

2.4.21 A plan illustrating indicative site components of the East Site is shown in **Figure 2.5** (PEI Report, Volume III).

West Site

2.4.22 The West Site would comprise up to four hydrogen liquefiers and the temporary storage of the hydrogen and its subsequent road transport. A site-wide cooling water system is also required for the Project and the cooling towers will be installed on the West Site. A nitrogen supply to the East Site would be provided via a pipeline connection from a nitrogen generator on the West Site. In addition, the West Site would also accommodate administrative offices and warehouse facilities associated with the operation of the facility as well as tanker loading bays associated with the bulk distribution of the green hydrogen.

2.4.23 Future phases of the Project would involve the construction of up to three hydrogen production units on the West Site, identical to those which will be established on the East Site. (see **Section 2.5**), making a total of six hydrogen production units across both sites, when fully built out. One flare would be required per Hydrogen Production Unit (HPU) and each flare would be fitted with a shroud to minimise visibility of the pilot light. Use of the flares would be exceptional i.e. for emergency use only and during start up and shut down.

2.4.24 Access to the West Site is proposed via two entrances, one from Kings Road and the other from the A1173. For details on operational traffic estimates see **Chapter 11: Traffic and Transport**.

2.4.25 An indicative list of key buildings and infrastructure that would be required on the West Site is set out in **Table 2.3**. This information will continue to be developed through the design process and further details will be presented in the ES. However, these are the maximum dimensions envisaged in order to present a worst case for assessment purposes.

Table 2.3 West Site Buildings and Infrastructure – Indicative List

Building / Infrastructure Name	No. of Units	Indicative Dimensions		
		Length (m)	Width (m)	Height (m)
Security and Visitor Building	1	15	20	8
Main Control Building	1	40	30	6
Workshop Building	1	40	30	10
Warehouse Building	1	45	30	10
Fire Pump House	1	5	3	5
Cooling Tower	1*	90	15	20
Main Incoming Station	1	30	10	10
Hydrogen Liquefier Compressor Building	4	60	45	25
Hydrogen Liquefier Vent	1	TBC	TBC	45
Piperacks	(overall length)	1600	10	15
Hydrogen production unit Flare	3	N/A	5m dia	45
Hydrogen production unit Compressor Building	3	20	20	20
Hydrogen production unit Main Stack	3	2	2	35
Hydrogen production unit	3	95	70	35
Hydrogen Trailer Filling Station	1**	120	30	8
Hydrogen Re-fuelling Station	1	72	53	8

*Consisting of 6 cells
** Dimensions are for 12 trailer filling points

2.4.26 West site utility / service connections and requirements are detailed in **Table 2.4**

Table 2.4 West Site Utility / Service Connections and Requirements

Utility / Service	Connection
Nitrogen	Nitrogen will be generated on the West Site and distributed to the East Site via a connection pipeline in the main pipeline corridor described below.
Natural gas	Natural gas will be supplied from the local main gas network. Connection details are not yet available.

Utility / Service	Connection
Power	A connection to the local grid from the West Site. Work is ongoing to determine the details of this supply. The voltage level of the supply is most likely to be 132kV. The main incoming substation will be located on the West Site. This will distribute to local power distributions centres as required by the electrical system design.
Potable water	A connection to the local water mains network will be made. The local provider is Anglian Water.
Cooling water	A site-wide cooling loop will be required. The source of make-up water is to be confirmed.
Firewater	A firewater system within the site boundary is required, however the source of the firewater is not yet confirmed. At this stage it is assumed that it will be from the potable water source and will require a fire water tank. Care in design would be taken to ensure proper segregation from any drinking or welfare related use. An allowance would be made for the retention of firewater (contaminated water from firefighting). It is anticipated that this would be a retention basin on site sized for the maximum fire case with allowance for storm conditions. This basin would also be able to act as a hold up for chemical spills and arrangements would be made to sewerage provided to collect spills
Wastewater	A site-wide drainage system would be required for surface run-off and is likely to include attenuation storage to mitigate the impact of introducing impermeable surfaces. The management of wastewater and its disposal from site will be considered during the development of the drainage strategy. Refer to **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage** for further details'

2.4.27 A plan illustrating indicative site components of the West Site is shown in **Figure 2.6** (PEI Report, Volume III).

Pipeline Corridors

2.4.28 A number of pipeline corridors are proposed within the Pipeline Area as described in the following paragraphs.

2.4.29 The first corridor includes the ammonia (NH_3) pipeline from the jetty to the East Site to deliver refrigerated liquid ammonia to the storage tank. The pipeline would be insulated and have emergency shutdown valves, thermal relief, expansion loops, and leak detection as required. The pipeline corridor would also include communications and utilities links. The pipeline would be above-ground and stacked vertically on a supporting rack/structure. It is assumed that the Jetty Access Road would run alongside this pipeline and this would allow maintenance to the pipeline as required. This area would also include a further corridor to the east of the Jetty Access Road reserved for a future pipeline, although this does not form part of the Project for which consent is sought.

2.4.30 For the purposes of assessment in this PEI Report, it is assumed that both the ammonia pipeline and the Jetty Access Road would run through the tree belt known as the Long Strip.

2.4.31 The second (or main pipeline) corridor would contain a series of pipelines, linking the East and West associated development Sites. These are expected to be parallel pipelines and would be installed underground. They are likely to be constructed using Horizontal Directional Drilling (HDD) or micro tunnelling techniques which minimises surface disturbance. The pipelines would include:

a. A hydrogen pipeline to allow the export of hydrogen from hydrogen production units installed on the East site to the liquefier(s) installed on the West Site.

b. An ammonia pipeline to allow the export of ammonia from the storage installed on the East site to the hydrogen production units installed on the West Site.

c. A nitrogen pipeline to supply nitrogen from a generator on the West Site for safety related purposes such as line purging or blanketing. A cathodic protection system would be installed to protect the pipeline(s) from corrosion.

d. A natural gas pipeline, which would be supplied from the local mains gas network located at the West Site, to supply the hydrogen production units installed on the East Site.

e. A cathodic protection system would be installed to protect the pipeline(s) from corrosion.

f. Utility connections would also be required in the Pipeline Corridor for the supply of communications links and electricity between the East and West Sites.

2.4.32 Additional pipelines and utility corridors would be needed between the various buildings and plant within the hydrogen production facilities.

Matters relevant to both East and West Sites

2.4.33 Permanent lighting requirements within the East and West Sites would be detailed within a Lighting Strategy, which will be prepared to accompany the DCO Application. The Lighting Strategy will outline measures proposed to avoid excessive glare and minimise spill of light to nearby receptors (including ecology and residents) as far as reasonably practicable.

2.4.34 Information on emissions to air and odour risk arising from the is the sites provided in **Chapter 6: Air Quality**.

2.4.35 Details regarding the disposal of solid waste are set out in **Chapter 20: Materials and Waste**.

2.4.36 Process safety and hazard management are addressed in **Chapter 22: Major Accidents and Disasters**.

Site Boundary and Design Evolution

2.4.37 The extents of land potentially required to implement the Project, referred to as the Site boundary, are illustrated on **Figure 1.1** (PEI Report, Volume III).

2.4.38 Since submission of the Scoping Report, the design of the Project has evolved to include up to two berths on the jetty (instead of a single berth) in order to enable a variety of vessels sizes of between 100m to 250m in length to be accommodated. This design change allows a greater range of vessel sizes to be accommodated at the Terminal to import and export different bulk liquids and builds in greater resilience to the proposed port infrastructure to enable it to remain responsive to the needs and demands of the energy and carbon capture and storage sectors. In order to incorporate this change, a minor extension to the proposed Site boundary within the marine environment has been included. The addition of the second berth to the Project is not considered to affect the EIA scoping as no new environmental effects would be created and the addition would not change the significance of any effect assessed.

2.4.39 Limited changes have also been made to the proposed Site boundary on the landside. The Pipeline Corridor, which connects the East and West sites in the Queens Road area has been widened to provide greater flexibility for the pipeline routeing in this area while access and the crossing of existing infrastructure are evaluated. The Site boundary has also been extended slightly along the southern boundary of the West Site due to the presence of a high-pressure gas pipeline in this location and the potential requirement for its relocation as a result of the Project. There would be no permanent above ground works in any of the terrestrial areas where the proposed Site boundary has been extended.

2.4.40 The changes to the Site boundary since submission of the Scoping Report are illustrated in **Figure 2.7** (PEI Report Volume III).

2.4.41 The proposed Site boundary has been based on the maximum anticipated area of land required either temporarily and/or permanently to construct, operate and maintain the Project.

2.4.42 The outcomes of statutory consultation, the EIA process and ongoing design modifications are expected to result in refinements being made to the Site boundary and the final proposed extent will be presented in the ES and the wider application as relevant.

2.5 Construction and Operational Phasing of the Project

2.5.1 Subject to the DCO being granted, there would be a phased approach to the construction of the Project. **Table 2.5** illustrates an indicative construction timeline for the Terminal. Under this scenario, the construction of the Terminal and first berth, and first phase of the green hydrogen production facility (including works on both the East and West sites as described above) is likely to start in early 2025. Construction of Berth 2 may commence in the final year of construction of Berth 1 but this will depend on a number of factors including (i) the size and frequency of ships serving the hydrogen production facility and (ii) market demands at that point in time. Construction of Berth 2 may take up to two years.

Table 2.5 Indicative Construction Timeline for the NSIP

Berth	Year 1	Year 2	Year 3	Year 4
Berth 1				
Berth 2			Earliest possible start year for Berth 2 (year 1)	

2.5.2 Following completion of the first phase of the hydrogen production facility, a further five phases would be constructed incrementally to increase the processing capacity as the market for green hydrogen increases. There would therefore be six phases of development in total, with each phase adding a hydrogen production unit (see also **Table 2.7** below).

2.5.3 For the purposes of this PEI Report, a development scenario has been defined for the Associated Development. This scenario is based on a six-phase construction timeline, likely to commence in early 2025, through to full completion of all phases over an indicative eleven-year period. This programme duration is likely to be a worst case in EIA terms as market demand could accelerate the programme, although Phase 1 would always represent the peak of construction, irrespective of the subsequent programme. This phasing is illustrated in **Table 2.6** and assumes that each phase of the Associated Development would become operational following its construction.

Table 2.6 Indicative Construction Phasing Timeline for Associated Development

Phase	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Phase 1											
Phase 2											
Phase 3											
Phase 4											
Phase 5											
Phase 6											

2.5.4 The start of construction of Phase 2 (here shown in Year 4), will depend on a number of factors including market demands for hydrogen at that point in time and the timing of subsequent phases would be subject to the same tests. Construction of Phases 2 – 6 may take up to eight years if built consecutively.

2.5.5 Each phase of the Project's development would involve construction of different buildings and infrastructure within each area of the Site, as presented in **Table 2.7**.

2.5.6 An indicative Project phasing plan is illustrated in **Figure 2.8** (PEI Report, Volume III) and further information will be provided in the ES.

Table 2.7 Anticipated Buildings and Infrastructure within the Site by Phase

Phase	Jetty	Pipeline Corridors	East Site	West Site
Phase 1 Construction: Y 1 – Y3	Jetty structure and Berth 1 Berth 2 (start) Jetty topside infrastructure	NH_3 pipeline from the jetty Jetty access road H_2 ,NH3 and Natural Gas pipelines between East and West Site Utilities and cabling to East and West sites	NH_3 tank One hydrogen production unit Internal access roads, drainage and utilities	One liquefier Tanker loading bays Administrative offices Other supporting building & facilities as listed in **Table 2.2** Internal access roads, drainage and utilities
Phase 2 Construction: Y4 – Y5 (TBC)	Berth 2 (complete)			One hydrogen production unit One liquefier
Phase 3 Construction: Y6 – Y7 (TBC)			One hydrogen production unit	One liquefier
Phase 4 Construction: Y8 – Y9 (TBC				One liquefier One hydrogen production unit
Phase 5 Construction: Y9 – Y10 (TBC)			One hydrogen production unit	
Phase 6 Construction: Y10 – Y11 (TBC)				One hydrogen production unit

2.6 Marine Construction Works

2.6.1 In the marine environment the structures would rest upon an open piled network of steel tubular piles likely to be driven by vibro and percussive piling techniques. The deck for the approach trestle and jetty would be supported by either concrete deck or precast and/or in-situ concrete deck. The topside pipework would be

fabricated off-site in modules and floated and/or craned into position. The high-level walkways between dolphins would be fabricated off-site and lifted into position. Over water working would be strictly controlled in accordance with Port safety procedures.

Capital Dredge

2.6.2 It has been determined that a capital dredge is required of the larger western berth. At this preliminary stage, the maximum spatial extent of the dredge is currently estimated at being approximately 45,000m^2, dredged into existing bathymetry which varies across the area between 5.5m below Chart Datum (CD) to 15.7mCD. The berthing pocket with appropriate side slopes would be dredged to a maximum of 16m below CD, including an allowance for overdredge. The indicative location of the dredge area that has been identified at this stage of the Project is shown on **Figure 16.4** (PEI Report, Volume III).

2.6.3 It is currently anticipated that dredging of approximately 100,000m^3 of material will be required and that this will comprise boulder clay and sand/silt, the proportions of which will be determined.

2.6.4 The exact capital dredge methodology has not yet been defined for this Project and further work will be undertaken in order to determine the most suitable method. However, it is anticipated that most of the dredging for the berth pocket would be undertaken by a backhoe dredger. Dredge operations would be continuous and operate 24 hours a day and seven days a week. This dredging method has been assessed as the worst-case scenario in terms of potential environmental effects in the relevant topic chapters of this PEI Report.

2.6.5 The Applicant acknowledges that it is under obligation, if possible and practicable, to identify a beneficial use for the dredged arisings. At this stage in the process, however, it is not considered that the dredged material will be of a quality suitable for alternative use, such as for reclamation purposes, although this will be kept under continuous review. If no beneficial use is identified it is anticipated that dredged material would be disposed of within licenced sites within the estuary, at Holme Channel disposal site (HU056) to dispose of in-erodible clay material, and Clay Huts disposal site (HU060) to dispose of alluvium material, subject to the dredge material being deemed suitable for disposal at sea by the Marine Management Organisation (MMO). A Waste Hierarchy Assessment (WHA), which will include a more detailed consideration of the alternative options for the dredge material, will be included as part of the ES (see **Chapter 4: Legislative and Consenting Framework**).

Sequencing of the Marine Construction Works

2.6.6 The exact construction methodology and sequencing for the marine works is being developed but is likely to involved the following ten steps:

Berth 1 – Site Establishment and Set Up

2.6.7 A temporary construction area would be created to serve as the temporary site base to mobilise and erect plant and store materials. The area would be approximately 200m by 100m.

Berth 1 – Approach Ramp

2.6.8 The approach ramp may be the first structure constructed using land-based plant and equipment. It would consist of a two abutment structures and a short bridge section that would span between them. The abutment structures would be constructed either side of the existing sea defence wall that runs along the frontage in this part of the port estate.

2.6.9 Precast reinforced concrete slabs/beams would then be used to form the bridge and a section final in situ concrete pour would seal the elements together. This would form the future roadway for traffic and pipework accessing the new berth.

Berth 1 – Approach Jetty and Berthing Trestle Approach

2.6.10 It is currently estimated that the approach jetty to support the berth(s) would be approximately 1050m in length and would consist of 42 piled traverse rigid frames and concrete decks with a 25m span between each frame.

2.6.11 Temporary works using portal gates would be set up for piling and then piles would be installed initially using vibro-piling to refusal. Percussive piling techniques may then be used to reach the final design level although appropriate mitigation measures may need to be deployed. This will be considered further as part of the ongoing technical assessments and reported in the ES.

2.6.12 Following completion of the piling, the piles would be prepared for the installation of the headstocks and precast decking, which as with the rear abutment above, would be sealed in situ with concrete to complete the deck and link between the approach ramp and the first traverse rigid frame.

2.6.13 This process would be repeated to construct each traverse rigid frame sequentially until the last frame is complete.

Berth 1 – Jetty Head

2.6.14 The approach jetty meets a jetty head which is approximately 50m by 20m long. At this stage, the preliminary design contemplates that the jetty head would be supported by 36 piles. Following completion of the piling for each finger pier, the precast headstocks would be installed, reinforcing fixed and then the in situ concrete troughs would be cast. Precast planks would then be installed between the troughs and sealed in situ with concrete to complete the deck structure, which would be followed by fender and bollard installation.

Berth 1 - Berthing and Mooring Dolphins

2.6.15 The jetty head would be supplemented by two berthing/mooring dolphins and a further eight mooring dolphins. At this stage, the preliminary design contemplates that the berthing dolphins would be supported by eight piles each and the mooring dolphins by four piles each. Following completion of the piling for each dolphin, the precast headstocks would be installed, reinforcing fixed and then the in situ concrete would be cast. One bollard and one fender would be installed on the mooring face of the berthing dolphins. The mooring dolphins would have one bollard each.

Berth 1 - Finishing works

2.6.16 Catwalks, pipe racking, fencing and screening would be installed following the above activities.

Berth 2 – Berth Trestle Approach

2.6.17 Following the completion of the Berth 1 infrastructure, the berthing trestle approach linking Berth 1 and Berth 2, including a Berth 2 approach trestle, would be constructed. It is currently estimated that this trestle would be approximately 525m in length and would consist of 23 piled traverse rigid frames and concrete decks with a 25m span between each frame.

2.6.18 Temporary works using the portal gates would be set up for piling and then three piles would be installed initially using vibro-piling to refusal and then percussive piling techniques may then be used to reach the final design level, although appropriate mitigation measures may need to be deployed as described above.

2.6.19 Following completion of the piling, the piles would be prepared for the installation of the headstocks and precast decking, which as with the rear abutment, would be sealed in situ with concrete to complete the deck and link between the approach ramp and the first traverse rigid frame.

2.6.20 This process would be repeated to construct each traverse rigid frame sequentially until the last frame is complete.

Berth 2 – Jetty Head

2.6.21 The works for the construction of the Berth 2 – Jetty Head would match those undertaken for Berth 1.

Berth 2 – Berthing and Mooring Dolphins

2.6.22 The jetty head would be supplemented by two berthing and eight mooring dolphins. At this stage, the preliminary design contemplates that the berthing dolphins would be supported by eight piles each and the mooring dolphins by four piles each. Following completion of the piling for each dolphin, the precast headstocks would be installed, reinforcing fixed and then the in-situ concrete would be cast. Two fenders would be installed on the mooring face of the berthing dolphins as well as two bollards. The mooring dolphins would have one bollard each.

Berth 2 – Finishing Works

2.6.23 Catwalks, pipe racking, fencing and screening would be installed following the above activities.

Marine Workforce and Construction Vessels

2.6.24 Based on comparisons with the Immingham Eastern Ro-Ro Terminal project construction workforce it is assumed within this PEI Report that the construction workforce for marine works would peak at approximately 250 personnel per day.

2.6.25 At this stage a combination of vessels is proposed to undertake the marine construction:

a. Jack-up barge (likely 1).
b. Floating barge containing a 500t crane (likely 2).
c. Multicats (likely 2).
d. Flat-top barges (up to 6).
e. Safety boat (likely 1).

Marine Working Hours

2.6.26 It is anticipated that core construction activities would be undertaken between 07:00 and 19:00, Monday to Sunday, but some activities, such as dredging, are assumed to be undertaken on a 24-hour basis and continue until completion for safety or quality reasons.

Sources of Noise and Vibration during Marine-side Works

2.6.27 Some noise and vibration can be expected during the construction of the approach jetty, jetty head and dolphins. Depending on the piling technique used, it is anticipated that some isolated, short-duration noise and vibration would be generated particularly during percussive piling. It is not proposed to use pre-cast driven piles.

2.6.28 Piling will be undertaken within the proposed working hours of 07:00 and 19:00, 7 days a week meaning there will be a minimum 12-hour continuous break in piling within each 24-hour period.

2.6.29 In order to reduce the level of potential impact associated with noise (underwater and airborne) and vibration during construction, a number of mitigation measures are being considered including the use of soft start procedures, the use of vibro piling where possible, seasonal working restrictions and the use of acoustic barriers and screening. These mitigation measures would be further developed if required through ongoing engagement with statutory authorities as part of the statutory consultation process and taking into account the final scheme design information and latest undertaken of potential effects which will be presented in the ES.

2.7 Landside Construction Works

Preliminary Works

2.7.1 The preliminary works required are the subject of on-going studies and would be confirmed in the ES that accompanies the Application but are likely to include:

a. Erection of site fencing and notices.
b. Environmental surveys and ground investigations including remedial work, if required.
c. Earthworks and site clearance.
d. Diversion and laying of services.

Temporary Construction Compounds and Laydown Areas

2.7.2 Construction compound and laydown areas would be required during construction. At this stage, laydown requirements have been estimated using conservative assumptions to ensure that the areas assessed in this PEI Report represent a worst-case.

2.7.3 **Figure 2.2** (PEI Report, Volume III) shows the indicative areas of land that are proposed for construction laydown and contractors' compound(s). Approximately 14.11ha of construction laydown area is required for materials and plant storage and laydown areas; field based fabrication and erection of components on-site, siting of concrete batching facilities; vehicle and cycle parking facilities; and construction offices and construction staff welfare facilities. The construction compound and laydown areas would be secured by security fencing and gates as appropriate.

2.7.4 The areas would be levelled to provide an even surface. No hazardous liquids would be stored un-bunded within the construction laydown areas.

Pipelines

2.7.5 The pipelines would be installed as a combination of above ground sections and below ground sections. Installation below ground would be used for the majority of the pipeline corridor linking the East and West Sites other than where these pipelines are within the sites themselves and connect into other above ground structures).

2.7.6 The pipeline installation would involve clearing of areas, preparation for pipeline installation and either Horizontal Directional Drilling (HDD) or micro tunnelling techniques.

2.7.7 Pipeline crossing of Queens Road, Laporte Road and the railway line will be required. It is envisaged that HDD would be used for these pipeline crossings.

2.7.8 The pipeline route would be marked with marker posts which would be set to ensure visibility. Cathodic protection posts would also be installed along the pipeline route.

2.7.9 It is assumed that part of the pipeline corridor connecting the East Site to the Jetty as well as the Jetty Access Road would be situated within the woodland belt, known as the Long Strip, protected by a TPO and if so removal of trees in this area would be unavoidable. This area would also include a further corridor to the east of the Jetty Access Road reserved for a future pipeline, although this does not form part of the Project for which consent is sought. The Applicant would select construction techniques and processes that seek to minimise encroachment into, and loss of, trees within the area by reducing the width of the necessary construction areas where practicable, for example by the vertical stacking of pipes on a supporting rack/structure in this location.

2.7.10 It is likely the bridleway through the TPO area would be temporarily diverted or closed during Project construction to protect the public for safety reasons. The bridleway would be reopened once the Phase 1 construction works are completed. This is considered in greater detail in **Chapter 23: Socio-economics**.

East and West Sites

2.7.11 The East and West Sites would require civil, mechanical and piping (M&P), and electrical and control (E&C) construction works.

2.7.12 Civil works would involve piling in the areas where the ground needs strengthening. Piling design is not yet complete but at this stage it is anticipated that this would likely be Continuous Flight Auger piles (CFA) to reduce noise and vibration during piling activities. The exact piling technique to be employed would be confirmed during the detailed design and further information would be presented in the ES.

2.7.13 The Project would use modularisation to reduce the on-site works and maximise the works completed in specialised fabrication facilities where practicable. M&P works would involve installation of large equipment and modules and would require heavy equipment such as cranes and transport vehicles. Coatings would be applied off-site with only coating touch up applied at site. An on-site fabrication facility would support the erection of steel and piping systems to complete any on-site modifications.

2.7.14 The E&C works would include the installation of modular electrical and control buildings which would be constructed off-site and assembled on site. There would also be buildings constructed on site in a "traditional" manner such as control buildings. The Project would be connected to the electricity transmission network via overhead and underground electricity transmission cables.

Ammonia Storage Tanks

2.7.15 The ammonia storage tank would be situated on the East Site and would be constructed by a specialist tank contractor. The tank is likely to be built by transporting large sections to site via the Port and then transported by the road network within the Port to the East Site for installation.

Drainage

2.7.16 The terrestrial area of the Site has existing drainage infrastructure that directs flow to ditches that cross neighbouring land before connecting to Internal Drainage Board (IDB) drains. To the west an existing culvert currently carries flow under the A1173 connecting to the Immingham Pump Drain. To the east, an existing ditch runs south, parallel with the River Humber and connects the Site to Stallingborough North Beck. The Immingham Pump Drain is pumped into Stallingborough North Beck which discharges to the River Humber. The development of the Site will make use of these existing connections to drain surface water, incorporating attenuation storage to mitigate the impact of introducing impermeable surfaces.

Site Access

2.7.17 Site access would be required for the delivery of construction materials and plant, and for general construction traffic. Due to the phased approach to the construction of the Project, multiple entrances/exits would be required. Access is proposed to be gained from the following roads:

a. Kings Road.

b. Queens Road.

c. Laporte Road.

d. A1173.

2.7.18 The creation of site accesses may require local modifications to create new and temporary site entrances / exits. These would be designed to minimise traffic disruption. Ongoing work will determine the optimum highways design for the necessary changes to the road systems and any temporary traffic restrictions while road work is being undertaken. This ongoing work will also inform the Project on the sequence of road works to reduce their impact.

2.7.19 Traffic management measures would be agreed with the local highways authority and employed during construction to ensure the safe movement of materials to working areas and laydown areas, reduce delays on other road users, and minimise interference with local traffic.

Construction Workforce and Construction Traffic

2.7.20 It is assumed that the construction workforce, across both the marine and terrestrial construction works, would peak at approximately 700 personnel per day. The largest daily development traffic trips (workforce and Heavy Goods Vehicles (HGVs)) are predicted to be generated in the first phase of construction (Year 2) and have been calculated to total approximately 1,500 two-way trips, with the majority of trips associated with workers commuting to and from the Site.

2.7.21 Construction traffic and the construction workforce are anticipated to travel to the Site via the A180 and A1173. Prior to the start of the construction phase, the contractor would prepare a Construction Traffic Management Plan (CTMP) to control HGV movements, as well as a Construction Worker Travel Plan (CWTP) to control the trips made by the construction workers (including encouraging car sharing) and thus reduce the impact of the workforce upon the highway network. The CTMP and CWTP would be based on, and incorporate, the contents and requirements of the Outline CTMP (OCTMP) and Outline CWTP (OCWTP) which will submitted with the DCO application.

2.7.22 These plans would set out measures and controls to limit the number of trips on the network in the peak hours, and as such would aim to limit the traffic impact of the construction phase as far as possible. Such plans would be implemented for the duration of the Project construction phase.

Construction Working Hours

2.7.23 Core construction working hours would be between 07:00 and 19:00 Monday to Friday and between 08:00 and 13:00 Saturdays. However, it is likely that some construction activities may need to be undertaken outside of these core working hours. This is partly because certain construction activities cannot be stopped, such as concrete pouring, but also to manage the construction programme. Where on-site works are to be conducted outside the core hours, they would comply with any restrictions agreed with the local planning authority, in particular regarding control of noise and traffic in accordance with the relevant requirements which would be secured by the DCO. The need for any such works

will be minimised where possible and will be carefully managed to reduce effects on local people.

Lighting

2.7.24 Construction lighting will be required in areas where natural lighting is unable to reach (sheltered/ confined areas) and prior to permanent lighting being installed. Lighting may also be required around the Site for night-time construction and during core working hours within winter months.

2.7.25 Artificial lighting would be provided to maintain sufficient security and health and safety for the Site. A Lighting Strategy will be prepared to accompany the DCO Application which outlines measures proposed to avoid excessive glare and minimise spill of light to nearby receptors (including local residents and some ecological receptors) outside of the Site as far as reasonably practicable.

2.7.26 The Outline Construction Environmental Management Plan (CEMP) will also set out standard best practice measures to minimise light spill including glare during construction. The contractor CEMP would be required to take these into account.

Commissioning

2.7.27 Commissioning of the hydrogen production facility would include testing and commissioning of the process equipment in order to ensure that all systems and components installed are in accordance with the requirements of AP and meets the requirement of the Environmental Permit. Commissioning of the processing equipment on the jetty topside would be handled in a similar way.

2.8 Construction Environmental Management Plan (CEMP) and Site Waste Management Plan (SWMP)

2.8.1 The Applicant would require the contractor to produce and maintain a CEMP to control construction activities to minimise, as far as reasonably possible, impacts on the environment. This would include industry best practice measures and specific measures set out in this PEI Report. An Outline CEMP will be appended to the ES and accompany the Application. It will set out the key measures to be employed during construction of the Project to control and minimise impacts on the environment. It will describe how monitoring and auditing activities would be undertaken, in order to ensure that mitigation, management and monitoring measures are carried out and are effective. A Requirement of the DCO would ensure that the contractor's CEMP must be in accordance with the principles set out in the Outline CEMP and would specify, as a minimum:

a. A code of construction practice, specifying measures designed to minimise the impacts of construction works.

b. A scheme for the control of any emissions to air.

c. A soil management plan.

d. A sediment control plan.

e. A scheme for environmental monitoring and reporting during the construction of the Project, including measures for undertaking any corrective actions.

f. A notification scheme for any significant construction impacts on local residents and for handling any complaints received from local residents relating to construction impacts.

2.8.2 In order to manage and monitor waste, including any spoil generated on-site, a Framework SWMP will be developed and submitted as part of the Outline CEMP with the Application setting out how waste streams would need to be estimated and monitored and goals set with regards to the waste produced. The contractor's CEMP would be required to incorporate the principles of the Framework SWMP as appropriate.

2.8.3 The Applicant would require that the contractor segregates the waste streams on-site, prior to them being taken to a waste facility for recycling or disposal. All waste removal from Project Site would be undertaken by licensed waste carriers and taken to licensed waste facilities.

2.8.4 Further assessment of impacts in relation to construction and operational waste is presented in **Chapter 20: Materials and Waste.**

2.9 Operational Phase

Terminal Operation

2.9.1 The Terminal will operate 24 hours a day, seven days a week and 365 days a year (though with lower activity at night compared to the day). The Terminal will have capacity to accommodate up to 400 vessel calls per year and it is anticipated that up to 12 of these calls will be associated with the hydrogen production facility. These vessel numbers have been assessed as the worst-case scenario in terms of potential environmental effects in the relevant topic chapters of this PEI Report. Operational staff numbers for the terminal, if both berths are fully utilised, are likely to be up to 40, with at least some staff working to shift systems.

Operation of the Hydrogen Production Facility

2.9.2 The hydrogen production facility is intended to be a continuous operation, although this will be dependent upon shipping frequency. The intention is therefore that the facility will operate 24 hours a day, seven days a week and 365 day a year.

2.9.3 Operational staff numbers and shift patterns will vary across the facility depending upon the duties being undertaken as illustrated in **Table 2.8**.

Table 2.8 Indicative Operational Staff Numbers and Shift Patterns

Role	Staff Numbers	Days	Base Location
Plant Manager	1	Mon – Fri	Site
Assistant Manager	1	Mon – Fri	Site

Role	Staff Numbers	Days	Base Location
Environment, Health & Safety Coordinator	1	Mon – Fri	AP Central Offices
Production Superintendent	1	Mon – Fri	Site
Shift Supervisors	4	7 days a week	Site (shift rotation)
Plant Operators	16	7 days a week	Site (shift rotation)
Jetty Operators (Topside infrastructure)	8	7 days a week	Site (shift rotation)
Clerks	1	Mon – Fri	Site
Plant Maintenance	4	7 days a week	Site
Drivers	50	7 days a week	Transient Work Force
Contractor	8	7 days a week	3rd party contractor
Janitor	2	Mon – Fri	3rd party contractor
Security	9	7 days a week	3rd party contractor
Other workers	14	5 days a week-	AP- Transient Work Force Based at the site but will travel outside the site
Total	120		

2.9.4 It is anticipated that once fully operational, a fleet of up to 50 tanker trailers and tractor units would operate in distributing the green hydrogen throughout the UK. This fleet is predicted to generate up to 98 daily movements (49 inbound, 49 outbound) and these movements would take place 24 hours a day.

Maintenance Dredging and Disposal

2.9.5 During operation of the Project, periodic maintenance dredging would be required. The overall volumes of the maintenance dredging associated with the Project would be smaller compared to that of the capital dredge. An estimate of the annual future maintenance dredge volume will be provided in the ES.

Hydrogen Production Facility Maintenance Requirements

2.9.6 The hydrogen facility will be designed and operated as a continuous operation high reliability plant with on stream >95%. The facility will have a planned preventive maintenance program. These will be a facility outage for several weeks for catalyst change every two years and other equipment will be taken offline for maintenance regularly without impacting facility operation In order to achieve the high availability, redundancy in equipment and controls will be provided.

2.10 Decommissioning

2.10.1 The landside elements of the Project have a design life of up to approximately 25 years although the operational life could be longer, depending on its integrity and market conditions at that time; when appropriate, this infrastructure would be decommissioned.

2.10.2 Decommissioning would be undertaken safely, in line with specific procedures and subject to risk assessment and permit to work schemes, and with regard to the environmental legislation at the time of decommissioning. The required licences and permits would also be acquired.

2.10.3 Decommissioning of the landside elements of the Project would likely involve leaving underground pipelines in situ and making them safe. All above ground infrastructure associated with the Project would likely be dismantled and all materials removed would be reused or recycled where possible or disposed of in accordance with relevant waste disposal regulations at the time of decommissioning. Land would be restored to a satisfactory state. If required and appropriate, refurbishment or replacement of specific plant would be performed to extend the life of the Project.

2.10.4 The Project does not make any provision for the decommissioning of the marine facilities of the Project. This is because the marine facilities would, once constructed, become part of the fabric of the Port estate and would, in simple terms, continue to be maintained so that it can be used for port-related activities to meet a long-term need. All plant or equipment on the jetty topside would likely remain in situ and repurposed where possible.

2.10.5 A Decommissioning Environmental Management Plan (DEMP) will be produced prior to decommissioning or demolition works being undertaken, which will detail measures to be implemented to avoid or reduce environmental impacts during the decommissioning of the landside elements. The provision of a DEMP will be secured by requirement of the DCO.

2.11 References

Ref 2-1 Groundsure. (2022).Enviro+Geo Insight Report (GS-9009838).

Ref 2-2 North East Lincolnshire Council (February 2010). Landscape Character Assessment.

Ref 2-3 Defra. (2022). MAGIC Maps. Available at: https://magic.defra.gov.uk/MagicMap.aspx (Accessed: August 2022).

Ref 2-4 UK Statutory Instruments. (2016). No. 1154. The Environmental Permitting (England and Wales) Regulations.

2.12 Abbreviations and Glossary of Terms

Table 2.9 Abbreviations and Glossary of Terms

Term	Acronym	Meaning
Ammonia	NH_3	Ammonia is a compound of Nitrogen and Hydrogen.
Associated British Ports	ABP	One of the UK's leading and best- connected ports groups, owning and operating 21 ports across England, Waste and Scotland.
Carbon Dioxide	CO_2	A colourless, odourless gas produced by burning carbon and organic compounds and by respiration.
Construction Environmental Management Plan	CEMP	A Construction Environmental Management Plan describes the specific mitigation measures to be followed by the appointed construction contractor to reduce potential nuisance impacts.
Continuous Flight Augering	CFA	A continuous flight auger drill is used to excavate a hole and concrete in injected through a hollow shaft under pressure as the auger is extracted.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Electrical and Control	E&C	-
European Marine Site	EMS	European Marine Sites are areas at sea, partly or completely covered by tidal water, which are protected by European law.
Horizontal Directional Drilling	HDD	Horizontal Directional Drilling is a method of installing underground pipelines through trenchless methods.
Hydrogen Production Unit	HPU	Process where the ammonia is used to produced hydrogen via an endothermic catalytic reaction. Also called a "converter" or a "dissociator".

Term	Acronym	Meaning
Liquefaction	-	The process of making something, especially a gas, into a liquid.
Local Wildlife Site	LWS	Non-statutory sites of nature conservation value that have been designated 'locally'. These sites are referred to differently between counties with common terms including: site of importance for natures conservation, county wildlife site, site of biological importance, site of local importance and sites of metropolitan importance.
Marine Management Organisation	MMO	The Marine Management Organisation is an executive non-departmental public body in the United Kingdom established under the Marine and Coastal Access Act 2009, with responsibility for English waters.
Mechanical and Piping	M&P	-
National Grid Reference	NGR	A system of geographic grid references, distinct from latitude and longitude.
Nationally Significant Infrastructure Project	NSIP	A type of project listed in the Planning Act 2008, which must be consented by a Development Consent Order.
Nitrogen	N_2	Nitrogen is a colourless, odourless unreactive gas.
North East Lincolnshire Council	NELC	The site falls within the administrative boundary of the North East Lincolnshire Council.
Site of Special Scientific Interest	SSSI	Area of land notified by Natural England under section 28 of the Wildlife and Countryside Act 1981 as being of special interest due to its flora, fauna or geological or physiological features.
Special Area of Conservation	SAC	Sites designated under EU legislation for the protection of

Term	Acronym	Meaning
		habitats and species considered to be of European interest.
Special Protection Area	SPA	Site designated under the European Directive on the Conservation of Wild Birds for the protection of birds in member states.
Trailer Suction Hopper Dredger	TSHD	Trailer suction hopper dredger are oceangoing vessels that can collect sand and silt from the seabed and transport it over large distances.
Tree Preservation Order	TPO	An order made by a local planning authority, under the Town and Country Planning Act 1990, in respect of trees or woodlands, The principal effect of a tree preservation order is to prohibit the cutting down, uprooting, topping, lopping, willful damage or willful destruction of trees without the local planning authority's consent.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 3: Need and Alternatives

Associated British Ports

Document History

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Table of contents

Tables

3 Need and Alternatives

3.1 Introduction

3.1.1 This Chapter of the PEI Report introduces the need and objectives for the Project and the alternatives that have been considered. Firstly, it sets out why there is a need for the Project in the Humber Estuary arising from the Government's clear plans to develop a hydrogen economy in the UK and capture CO_2 for sequestration to drive decarbonisation and the transition to net zero. Secondly the chapter then explains why at this preliminary stage it is considered that the Project is most suitable to meet the identified need. The explanation of need draws from the National Policy Statement for Ports (NPSfP) (Ref 3-1) and other relevant Government and National and Local policy. The chapter is set out as follows:

a. The need and objectives for the Project are explained.

b. The alternatives that have been considered during the evolution of the Project and design process as presented in **Chapter 2: The Project**, up to this stage of statutory consultation.

3.1.2 A more detailed need case and further information on main alternatives considered and reasons why the Project site was selected will be set out in the Environmental Statement (ES) and documentation to support the application for development consent.

3.2 Summary of Overarching Project Need

3.2.1 The need for the Project arises in response to the Government's strategy to deliver the UK's legally binding net zero obligations, which requires the delivery of new infrastructure to support meeting those obligations. The Ten Point Plan for a Green Industrial Revolution (November 2020) (The Ten Point Plan), The Net Zero Strategy: Build Back Greener (October 2021), and the British Energy Security Strategy (April 2022) together set out the Government's strategy to decarbonise industry in line with the plan for achieving the UK's legally binding net zero obligations by 2050. The Government has detailed policies for how this would be achieved through the deployment of a combination of different technologies and measures. These include carbon capture, utilisation and storage (CCUS) and fuel switching to low carbon hydrogen. Business models and funding mechanisms have been created to support the use of low carbon hydrogen and deployment of CCUS infrastructure. Ports will play an important role in industrial decarbonisation through the provision of enabling infrastructure, allowing the technologies and measures needed for a transition to net zero to be deployed.

3.2.2 As such, there is a compelling need to develop a range of infrastructure including specific port infrastructure, both landside and within the marine area, to meet the growing and changing nature of demand from the energy sector as the transition to net zero gains momentum. The provision of port infrastructure to increase capacity and resilience in response to an identified need aligns with Government policy guidance set out in the NPSfP, see **Section 3.3** of this Chapter.

3.2.3 The Project would directly support the aims of the Government's decarbonisation strategy, through the production and delivery of green hydrogen. The Project will contribute to the decarbonisation of hard to abate transport emissions and will help to improve Britain's energy security and support the Levelling Up agenda.

3.2.4 The Port of Immingham plays a key role in the movement of freight in and out of the UK, forming part of one of the UK's largest port complexes together with Grimsby, Hull and Goole. Furthermore, the Port of Immingham is the UK's largest port by tonnage, handling over 46 million tonnes of cargo every year. However, there is currently insufficient suitable capacity and infrastructure designed to meet the emerging future demand from the energy sector at the Port of Immingham.

3.2.5 The energy sector requires port infrastructure that can provide deep water berths to accommodate very large vessels to import ammonia and liquefied carbon dioxide and import or export other energy products. The port infrastructure needs to be directly proximate and connected to the landside infrastructure including storage for ammonia and hydrogen, production plants to convert ammonia to hydrogen, carbon dioxide compressors and pipeline links. The Project would provide infrastructure designed to meet that need and contribute towards the Government's aim of achieving 10GW of low carbon hydrogen production capacity by 2030, as defined in the British Energy Security Strategy. Future energy cargoes that would support the transition to net zero would also be accommodated.

3.2.6 The provision of additional port capacity in direct proximity to the Humber industrial cluster presents an ideal opportunity for the delivery of clean energy production and industrial decarbonisation through supporting the delivery of CCS (Carbon Capture and Storage). The Viking CCS project, a carbon dioxide transport and storage (T&S) network linked to the former Viking gas fields in the Southern North Sea, is currently being developed. The developer of the Viking CCS project (Harbour Energy) and ABP are collaborating around the potential to develop a facility for the discharge of liquefied CO_2 cargoes from vessels at the Immingham Green Energy Terminal (IGET) facility into the Viking CCS T&S for storage. The proposed pipeline from Immingham to Theddlethorpe can be directly connected to IGET to provide a method of transporting CO_2 captured at other dispersed industrial and power generation locations by ship to Immingham for sequestration. Shipping of CO_2 is crucial to ensuring all areas of the UK can remain competitive by providing access to CO_2 storage for areas not located adjacent to pipelines connecting geological storage. The potential facilities for the connection of IGET to the Viking CCS storage sites will be the subject of a separate future consent should they be progressed.

3.3 The Objectives of the Project and Need

3.3.1 The high level objectives for the Project have been developed having regard to the Government's strategy to deliver the legally binding net zero obligations and the requirements of national and local planning policy as set out in the National Policy Statements for ports and energy (Ref 3-1), the National Planning Policy Framework (Ref 3-2) and the North East Lincolnshire Local Plan (Ref 3-3). Other

factors include the location of the Port in proximity to the UK's largest industrial cluster in the Humber, the Viking CCS project, the Humber Industrial Cluster Plan[1] and the vision set by the Humber Energy Board[2] to deliver decarbonisation.

3.3.2 The objectives for the Project are as follows:

a. To provide essential port infrastructure, capacity and resilience to support the growth and changing strategic needs of the energy sector to support decarbonisation within the Humber Industrial Cluster and the Humber Enterprise Zone.

b. To provide capacity to support import and export of a range of bulk liquid energy products including (i) ammonia (NH_3) to produce green hydrogen to help decarbonise the United Kingdom's (UK) transport sector and (ii) carbon dioxide (CO_2), to facilitate carbon capture and storage, both of which will assist transition towards net zero.

c. To deliver and operate new port infrastructure in a safe, efficient and sustainable manner by making effective use of available land, water, transport and utility connections which exist in and around the Port of Immingham.

d. To minimise adverse impacts on the environment and safeguard the health, safety and amenity of local residents.

e. To enhance both the local and regional economy through direct investment in and around the Port of Immingham and by partnering with the supply chain, providing opportunities for training, upskilling, apprenticeships and local employment.

3.3.3 The need for the Project, which arises from the Government's plans for decarbonisation and transition to net zero, is explained further in the following paragraphs by reference to the project objectives.

Objective 1 - To provide essential port infrastructure, capacity and resilience to support the changing strategic needs of the energy sector to support decarbonisation within the Humber Industrial Cluster and the Humber Enterprise Zone

3.3.4 To explain the purpose of the first objective, an explanation of the need to provide energy capacity to help deliver decarbonisation, the need for energy security and the need for the Project to be located in the Humber is provided.

[1] The Humber Industrial Cluster Plan will set out a comprehensive plan for the Humber Cluster to achieve net zero by 2040

[2] The Humber Energy Board was convened by two Local Enterprise Partnerships across the region (the Hull and East Yorkshire Local Enterprise Partnership (LEP) and the Greater Lincolnshire LEP) to act as a single voice on climate change matters.

Reference is made to the Government's strategy to achieve net zero, and national and local planning policy.

The need to provide energy capacity to meet net zero obligations

3.3.5 To support the Government's plan to achieve net zero by 2050, sufficient infrastructure capacity is needed to enable the energy sector to deliver measures for decarbonisation. The Port of Immingham is already an established part of the supply chain for the energy sector but needs to respond to the changing needs of the energy market in this location and the requirements of various aspects of the response to Government energy policy including CCS and low-carbon hydrogen production and the Humber Industrial Cluster Plan.

3.3.6 The Energy White Paper 'Powering our Net Zero Future' (December 2020) (Ref 3-4) seeks to transform the energy sector recognising that the necessity of tackling climate change offers huge opportunity for both growth and job creation. The White Paper sets out the Government's long term strategic vision to transition to clean energy and meet net zero by 2050, and emphasises that *"simply setting the target is not enough, we need to achieve it"*. The Energy White Paper recognises that achieving the goal of net zero by 2050 requires "*action across the economy*" and a wide set of measures and initiatives to *"reduce emissions from power, buildings, industry, upstream oil and gas, and address the implications for the energy system of electrifying surface transport*".

3.3.7 In relation to hydrogen, the Energy White Paper states *"As a gas that can be used as a fuel without emitting harmful greenhouse gasses, hydrogen will be critical in reducing emissions from heavy industry, as well as in power, heat and transport"*. The Energy White Paper committed the Government to publishing a dedicated Hydrogen Strategy to position the UK as a world leader in the production and use of clean hydrogen. The UK Hydrogen Strategy (August 2021) (Ref 3-5) recognises the scale of the challenge to increase green hydrogen production, stating in Chapter 1 *"With virtually no low carbon hydrogen produced or used currently, particularly to supply energy, this will require rapid and significant scale up from where we are today".* Paragraph 1.2 of the Hydrogen Strategy emphasises the need for hydrogen infrastructure stating, *"hydrogen can only be considered as a decarbonisation option if it is readily available"*. Paragraph 1.3 builds on this, stating *"as a result of its geography, geology, infrastructure and capabilities, the UK has an important opportunity to demonstrate global leadership in low carbon hydrogen"*. Section 2.2 of the Hydrogen Strategy outlines how hydrogen development can be delivered and scaled up, and states *"Investors, developers and companies across the length and breadth of the UK are ready to build if the policy environment is in place",* further stating at 2.4.2 that *"developing and scaling hydrogen power during the 2020s can reduce the burden on other technologies such as renewables, CCUS and nuclear".*

3.3.8 In terms of carbon capture and storage, the ambition of the Energy White Paper "*is to capture 10Mt of carbon dioxide a year by 2030*" recognising that the deployment of CCUS is "*fundamental to the decarbonisation of energy intensive industries such as steel, cement, oil refining and chemicals. CCUS can help secure the long-term future of these industries and enable production of clean*

hydrogen at scale." The Energy White Paper is clear on the challenge of developing the necessary infrastructure, stating that *"Developing carbon transport and storage infrastructure will require large upfront capital expenditure, to construct offshore and onshore pipelines and develop storage sites and wells. We will help to put in place this critical network, as the foundation for the scaling up of CCUS across the UK."*

3.3.9 The NPSfP recognises the essential role that ports play in the growth of the UK economy. Paragraph 1.2.4 states that this NPS "*sets out the Government's conclusions on the need for new infrastructure, considering the current place of ports in the national economy, the available evidence on future demand and the options for meeting future needs. It explains to planning decision makers the approach they should take to proposals, including the main issues which, in the Government's view, will need to be addressed to ensure that future development is fully sustainable, as well as the weight to be given to the need for new port infrastructure and to the positive and negative impacts it may bring".*

3.3.10 Within paragraph 3.1.4 the NPSfP recognises that *"for an island economy, there are limited alternatives available to the use of sea transport for the movement of freight and bulk commodities. Air freight is often used for high-value items and express deliveries, and the Channel Tunnel has a significant role in freight as well as passenger transport. But these alternatives are constrained by the volumes that can be practically carried by air, by the capacity of the rail links through the tunnel and in the case of aviation by cost and environmental disadvantages. As a consequence, shipping will continue to provide the only effective way to move the vast majority of freight in and out of the UK, and the provision of sufficient sea port capacity will remain an essential element in ensuring sustainable growth in the UK economy".*

3.3.11 The role that ports play in the energy market is recognised in the NPSfP which states at paragraph 3.1.5 'Energy Supplies' that '*Ports have a vital role in the import and export of energy supplies'* and that '*port handling needs for energy can be expected to change as the mix of our energy supplies changes and particularly as renewables play an increasingly important part as an energy source".*

3.3.12 The Overarching National Policy Statement for Energy (July 2011) (EN-1) (Ref 3-6) sets out the Government's policy for the development of nationally significant energy infrastructure which seeks a reduction in carbon emissions, energy security and affordability. In the case of IGET, Air Product's hydrogen production facilities are associated development but EN-1 provides context for the low carbon energy and CCS sectors and is an important material consideration in support of the need for the Project. Low carbon hydrogen production and use are also specifically included in the Draft Overarching National Policy Statement for Energy (September 2021) (Draft EN-1).

3.3.13 Within EN-1, the Government has emphasised the importance of CCS, highlighting at paragraph 3.6.5 that the Government is supporting the cost of four commercial scale demonstration projects at UK power stations and also stating that *"the demonstration programme will also require the construction of essential infrastructure (such as pipelines and storage sites) that are sized and located*

both for the purpose of the demonstration programme and to take account of future demand beyond the demonstration phase". Also highlighted in EN-1 is the need for more gas infrastructure. Paragraph 3.8.9 states *"new import infrastructure, both in terms of conventional import pipelines, gas reception facilities and LNG import facilities"* are likely to be required.

3.3.14 Draft EN-1 outlines the policy context for the development of nationally significant energy infrastructure to support the vision set out in the Energy White Paper. Draft EN-1 considers the large-scale infrastructure that will be required to ensure the UK can provide a secure, reliable and affordable supply of energy while also meeting decarbonisation targets.

3.3.15 In terms of energy capacity, Draft EN-1 sets out that the Government sees the need for significant amounts of new, large-scale infrastructure to meets its energy objectives. Paragraph 3.2.4 of Draft EN-1 sets out that "*it is for industry to propose new energy infrastructure within the strategic framework set by government…. the government does not consider it appropriate for planning policy to set limits on different technologies but planning policy can be used to support the government's ambitions in energy policy and other policy areas."* It is considered that this Project clearly fulfils these ambitions.

3.3.16 The National Planning Policy Framework (NPPF) (July 2021) Ref 3-2) sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced. It highlights that the purpose of the planning system is to contribute to the achievement of sustainable development, providing a *"presumption in favour of sustainable "development"*. The NPPF highlights the challenges of climate change and how the planning system should support the transition to a low carbon future, including paragraph 152 which supports encouraging *"renewable and low carbon energy and associated infrastructure".* Paragraph 158 states that *"When determining planning applications for renewable and low carbon development, local planning authorities should: a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and b) approve the application if its impacts are (or can be made) acceptable".*

3.3.17 The Project will directly support the Government's strategy to achieve net zero by 2050 by providing port infrastructure for the deployment of hydrogen and CCS technologies, both being essential measures to achieve industrial decarbonisation.

The need for energy security

3.3.18 The UK becoming energy independent and being in a position to draw upon its own energy supplies is an increasingly urgent issue. The British Energy Security Strategy (Ref 3-7) addresses the UK's vulnerability to international energy prices and highlights the importance of reducing the UK's dependence on imported oil and gas. The Government identifies that the UK is well placed to exploit all forms of low carbon hydrogen production and commits to doubling its hydrogen production ambition to 10GW by 2030. In meeting net zero by 2050, the British

Energy Security Strategy highlights the importance of the North Sea reserve. It is stated that we must *"use the empty caverns for CO_2 storage, bring through hydrogen to use as an alternative to natural gas and use our offshore expertise to support our offshore wind sector".*

3.3.19 The British Energy Security Strategy recognises that to accelerate our supply of low carbon hydrogen, it requires *"designing, by 2025, new business models for hydrogen transport and storage infrastructure, which will be essential to grow the hydrogen economy"*.

3.3.20 With regards to energy security, EN-1 highlights how critical it is that the UK continues to have secure and reliable supplies of energy to make the transition to a low carbon economy. Under paragraph 2.2.20, achieving security of supply includes the use and import of *"a diverse mix of technologies and fuels, so that we do not rely on any one technology or fuel. Diversity can be achieved through the use of different technologies and multiple supply routes (for example, primary fuels imported from a wide range of countries"*. Paragraph 2.2.21 states that *"Developing our infrastructure … will help us maintain and improve our security and access to competitive supplies, particularly for electricity generation and gas importation and storage".*

3.3.21 The NPSfP, at paragraph 3.1.5 recognises that *"Ensuring security of energy supplies through our ports will be an important consideration, and ports will need to be responsive both to changes in different types of energy supplies needed (and to the need for facilities to support the development and maintenance of offshore renewable sites) and to possible changes in the geographical pattern of demand for fuel"*. Further at paragraph 3.3.3, the NPSfP sets out that new port infrastructure should also *"ensure competition and security of supply"*. The Project clearly fulfils these objectives through the first proposed use of the terminal for the importation of green ammonia for green hydrogen production.

The need for capacity to be located in the Humber

3.3.22 The Government's Levelling Up White Paper (February 2022) (Ref 3-8) seeks to end geographical inequality and improve economic dynamism and innovation to drive growth across the whole country. For levelling up and the transition to net zero, the White Paper states *"Industrial centres stand to benefit from employment and export opportunities created by the transition to Net Zero. Many are building on a rich manufacturing and engineering heritage and opportunities for synergies between different green technologies and industries provide a strong foundation for place-based clusters to develop."*

3.3.23 On Figure 1.30 of the Levelling Up White Paper, the Humber estuary is shown as being a location for energy intensive and process industries. Furthermore, the White Paper states *"The Humber is playing a key role in energy. Through its natural geography and emerging cluster, the Humber will help to ensure that offshore wind, industrial decarbonisation, carbon capture, and other technologies will sustain key industries and create high quality jobs at scale for years to come."* The White Paper reports that a private sector board will be created to provide strategic leadership and drive development and delivery of the Humber economic priorities including the Humber Net Zero Cluster. The White Paper further states

that *"The Humber is the UK's largest trading estuary and has the capacity to make significant inroads into decarbonisation and the application of new and related technologies."*

3.3.24 In terms of specific measures in the Humber area, the Levelling Up White Paper sets out that a new freeport for Yorkshire and the Humber will be created, *"The Humber Freeport, spanning Hull, Goole, Immingham and Grimsby will provide new opportunities for Yorkshire and the Humber. This location has excellent connectivity to the UK's manufacturing hinterland and supply chain, and is ideally positioned to service the growing North Sea offshore wind industry. The Freeport will build on existing regional strengths, including renewable energy, clean growth and advanced manufacturing, to deliver thousands of jobs and new investment."*

3.3.25 The Project is seeking to respond to existing and emerging markets and customers by focusing development in and around the Port of Immingham to support the emerging future needs of the energy sector. The need for the Project to be located in the Humber arises from market demand for additional port capacity in that location. Furthermore, the Project is in close proximity to the proposed Viking CCS project and East Coast Cluster, the latter being a collaboration between Zero Carbon Humber, Net Zero Teesside and Northern Endurance Partnership with the aim of removing 50% of the UK's industrial CO_2 emissions, protecting thousands of jobs and establishing the region as a globally-competitive climate-friendly hub for industry and innovation. The Cluster includes a diverse mix of low carbon projects including industrial carbon capture, low-carbon hydrogen production, negative emissions power, and power with carbon capture. These technologies are essential for the UK to meet its net zero obligations.

3.3.26 This market led approach is reflected in the NPSfP which seeks to enable the ports industry to respond to the needs of the market but in a way that delivers sustainable development. At paragraph 3.3.5 the NPSfP states that port development should wherever possible be *"an engine for growth; supporting sustainable transport by offering more efficient transport links with lower external costs" and support "sustainable development by providing additional capacity for the development of renewable energy".*

3.3.27 In terms of the Government's assessment of the need for new infrastructure, it is recognised at paragraph 3.4.1 of the NPSfP that the need for port infrastructure depends not only on demand for port capacity, but also on the need to retain the flexibility that ensures port capacity is located where it is required and, on the need to ensure effective competition and resilience in port operations. Paragraph 3.4.2 of the NPSfP states that *"over time and notwithstanding temporary economic downturns, increased trade in goods and, to a lesser extent in commodities, can be expected as a direct consequence of the Government's policies to support sustainable economic growth and to achieve rising prosperity".* With the movement of 95% of all goods in and out of the UK being by sea, and very limited alternatives being available, the majority of this increase will need to be through ports around the coast of the United Kingdom. At paragraph 3.4.11 of the NPSfP, it states that *"capacity needs to be provided at a wide range of facilities and locations, to provide the flexibility to match the changing demands of*

the market". Paragraph 3.4.12 reinforces this statement, setting out that *"Port development must be responsive to changing commercial demands, and the Government considers that the market is the best mechanism for getting this right, with developers bringing forward applications for port developments where they consider them to be commercially viable."*

3.3.28 Paragraph 3.4.13 of the NPSfP recognises that competition is an important factor in driving efficiency and lowering costs and that *"effective competition requires sufficient spare capacity to ensure real choice for port users"* and *"requires ports to operate at efficient levels, which is not the same as operating at full physical capacity"*. This is due to fluctuating levels of demand resulting in the need to ensure that there is flexibility in physical capacity to accommodate such fluctuations. It emphasises that *"The Government believes the port industry and port developers are best placed to assess their ability to obtain new business and the level of any new capacity that will be commercially viable, subject to developers satisfying decision-makers that the likely impacts of any proposed development have been assessed and addressed."*

3.3.29 Paragraph 3.4.14 underlines the contribution coastal shipping, as a substitute for inland freight transport, can make towards decongestion and decarbonisation and to the environment. The NPSfP states *"facilitating coastal shipping as a substitute for inland freight transport of various commodities" "can mean reduced emissions of pollutants per tonne-mile, with those emissions, and noise, at the same time having much less effect on people close to the transport arteries."* Furthermore, *"Coastal shipping is expected to grow, and developers are expected to provide suitable facilities on a commercial basis".* The Project includes provision for a second berth to support smaller vessels which will be provided if the demand exists. Vessels utilising the second berth would contribute to decongestion and decarbonisation as required by the NPSfP.

3.3.30 In terms of resilience, the NPSfP sets out that, *"Spare capacity also helps to assure the resilience of the national infrastructure. Port capacity is needed at a variety of locations and covering a range of cargo and handling facilities, to enable the sector to meet short-term peaks in demand, the impact of adverse weather conditions, accidents, deliberate disruptive acts and other operational difficulties, without causing economic disruption through impediments to the flow of imports and exports."*

3.3.31 The NPSfP sets out the compelling need for substantial additional port capacity over the next 20-30 years and states that excluding the possibility of providing additional capacity would be to accept limits on economic growth and the price, availability and choice of goods imported as well as limit the local and regional benefits that new development might bring. Paragraph 3.4.16 recognises that this outcome would be *"strongly against the public interest".*

3.3.32 Under section 3.5 of the NPSfP, guidance is outlined to the decision maker in assessing the need for additional capacity. Paragraph 3.5.1 states that the decision maker should accept the need for future capacity to *"cater for long-term forecast growth in volumes of imports and exports by sea for all commodities indicated by the demand forecast figures set out in the MDST forecasting report accepted by Government, taking into account capacity already consented ...;*

support the development of offshore sources of renewable energy; offer a sufficiently wide range of facilities at a variety of locations to match existing and expected trade, ship call and inland distribution patterns and to facilitate and encourage coastal shipping; ensure effective competition among ports and provide resilience in the national infrastructure; and take full account of both the potential contribution port developments might make to regional and local economies". The Project will help provide resilience in the port sector through the provision of additional port capacity including a terminal with a deep water jetty and up to two berths, pipelines, ammonia storage and the hydrogen production facility. The ammonia would be produced outside the UK using renewable electricity. The Project will also provide the marine infrastructure required to facilitate the transfer of liquified CO_2, linking to the planned Viking CCS project. This will support growth of the energy sector in the Humber Estuary, directly supporting Government policy on decarbonisation and net zero obligations.

3.3.33 Paragraph 3.5.2 recognises the urgent need for infrastructure of the types covered as set out above and because of that need, states that *"the [determining authority] should start with a presumption in favour of granting consent to applications for ports development. That presumption applies unless any more specific and relevant policies set out in this or another NPS clearly indicate that consent should be refused".*

3.3.34 The North East Lincolnshire Local Plan 2013-2032 (2018) sets out the local authority's vision and strategy for development, including why, where and how the Borough will grow. The overall spatial vision for the region is to ensure that by 2032 North East Lincolnshire is *"nationally and internationally recognised as a centre for offshore renewables, focusing on operations and maintenance and contributing significantly to the Humber's 'Energy Estuary' status"*. This includes growing key sectors including ports and logistics and renewable energy.

3.3.35 The Local Plan outlines in paragraph 6.6 that the Ports of Immingham and Grimsby together form the largest port complex in the UK by tonnage handled and the fourth largest in Europe. They are of international trading significance, which provides the Borough with strong logistical operations capacity.

3.3.36 The Local Plan does not preclude other forms of renewable energy coming forwards, stating at Paragraph 14.104 that *"The presence of the port, combined with the Borough's infrastructure network associated with a long history of industry and energy production provides excellent foundations for a range of onshore renewable energy technologies to continue to be developed."*

3.3.37 The Project will provide capacity for liquid bulk users of the jetty in the Humber. It is anticipated that the first user of the jetty, (Air Products) will use approximately 3% of the annual jetty capacity of approximately 400 ship calls per year ('maximum throughput' across both berths if they are constructed is in excess of 16 million tonnes) in association with the import of ammonia for processing. The remaining jetty capacity provides substantial flexibility for any expansion by Air Products or use by other liquid bulk users, including the carbon capture sector. The environmental effects of the Project have been assessed through the establishment of a series of maximum development extents known as a 'Rochdale Envelope' as set out in **Chapter 5: EIA Approach** of this PEI Report.

This takes account of opportunities to increase the use of the jetty by other liquid bulk customers, including the carbon capture sector, up to the annual jetty capacity or 'maximum throughput'.

Objective 2 - To provide capacity to support import and export of a range of bulk liquid energy products including (i) ammonia (NH_3) to produce green hydrogen to help decarbonise the United Kingdom's (UK) transport sector and (ii) carbon dioxide (CO_2), to facilitate carbon capture and storage, both of which will assist transition towards net zero.

3.3.38 To explain the purpose of the second objective, an explanation of the need for green hydrogen capacity and other bulk liquids is provided. Reference is made to the Government's strategy to achieve net zero, and national and local planning policy.

The need specifically for green hydrogen capacity and other bulk liquids

3.3.39 There is a growing need to develop green hydrogen capacity in the UK and while some of this is being facilitated through UK production, the opportunity exists to import green hydrogen from other countries where surplus renewable energy can be harnessed. The safest and most appropriate way to transport hydrogen is in the form of ammonia. As shipping will continue to provide the most effective way to move ammonia in and out of the UK, sufficient port and landside infrastructure is required for its subsequent storage and processing to convert it to hydrogen. The Project seeks to provide the necessary infrastructure and capacity not only for ammonia cargoes but also for future CO_2 to link to the Viking CCS carbon transport and storage proposals.

3.3.40 The Ten Point Plan sets out the Government's aim for the UK to develop 5GW[3] of low carbon hydrogen production capacity by 2030 (Ref 3-9). The Ten Point Plan seeks to drive the growth of low carbon hydrogen stating that *"Hydrogen is the lightest, simplest and most abundant chemical element in the universe. It could provide a clean source of fuel and heat for our homes, transport and industry".*

3.3.41 The Energy White Paper further supports this aim, setting out that hydrogen is earmarked as a priority area in the Net Zero Innovation Portfolio with the intention to invest in new hydrogen technologies. Within the White Paper it is stated *"by 2050 we expect low-carbon options, such as clean hydrogen and long-duration storage, to satisfy the need for peaking capacity and to ensure security of supply"*, which highlights a need for low-carbon, hydrogen infrastructure. Finally, it is also highlighted that *"action now to deploy hydrogen during the 2020's will*

[3] The Government revised this target in the British Energy Security Strategy (April 2022) where it is stated *"We will double our UK ambition for hydrogen production to up to 10GW by 2030, with at least half of this from electrolytic hydrogen"*.

stimulate domestic supply chains, enabling UK businesses to capture increasing international demand for hydrogen goods and services".

3.3.42 The UK Hydrogen Strategy also supports the Government's aim, recognising that *"Hydrogen is one of a handful of new, low carbon solutions that would be critical for the UK's transition to net zero. As part of a deeply decarbonised, deeply renewable energy system, low carbon hydrogen could be a versatile replacement for high-carbon fuels used today - helping to bring down emissions in vital UK industrial sectors and providing flexible energy for power, heat and transport."* Chapter 2.3.2 also indicates that *"Hydrogen's ability to store energy for long periods of time and in large quantities is an important part of its strategic value to a fully decarbonised energy system, and we envisage hydrogen storage being a key part of future network infrastructure".*

3.3.43 Paragraphs 3.4.11 to 3.4.16 of Draft EN-1 establish the need for low carbon hydrogen infrastructure, stating *"The government is committed to developing low carbon hydrogen, which will be critical for meeting the UK's legally binding commitment to achieve net zero by 2050, with the potential to help decarbonise vital UK industry sectors and provide flexible deployment across heat, power and transport."* Paragraph 3.4.12 sets out that *"Hydrogen can be produced through water electrolysis with low carbon power ('green' hydrogen) or through methane reformation with CCS ('blue' hydrogen). The government's view is that a twin track approach of developing both green and blue hydrogen production will be needed to achieve the scale of low carbon hydrogen production required for net zero.*" Paragraph 3.4.15 further states that *"in the future, low carbon hydrogen may become an internationally traded energy vector, piped or shipped from areas of low-cost production to areas of demand. While the development of this market is uncertain, the UK could become both an exporter and Importer of low carbon hydrogen, potentially necessitating current gas infrastructure to be configured or for new infrastructure to be put in place"*. It is also stated at Paragraph 3.4.16 that *"There is an urgent need for all types of low carbon hydrogen infrastructure to allow hydrogen to play its role in the transition to net zero."*

3.3.44 The Draft EN-1 also sets out the need for new nationally significant CCS infrastructure for the transition to a net zero economy. In paragraph 3.5.1, it sets out that the Government's Climate Change Committee states that new CCS infrastructure is said to be a *"necessity not an option"* and that *"CCS infrastructure will also be needed to capture and store carbon dioxide from hydrogen production from natural gas, industrial processes, the use of bioenergy …. and from the air".*

3.3.45 The Project aligns with the Government's aim to scale up production of green hydrogen and also to help facilitate the use of carbon capture through the proposed CO_2 import facility and link to the Viking CCS project. Air Products wish to develop a green hydrogen production facility (the Associated Development) which aligns with the Government's ambition to deliver 10GW of low carbon hydrogen by 2030. The use of the hydrogen produced by the facility in substitution of other fuels used in road transport could eliminate approximately 580,000 tonnes of greenhouse gas emissions each year, the equivalent of taking

20,000 diesel HGVs off the road. Refer to **Chapter 19: Climate Change** for the impact of the Project on greenhouse gas emissions.

Objective 3 - To deliver and operate new port infrastructure in a safe, efficient and sustainable manner by making effective use of available land, water, transport and utility connections which exist in and around the Port of Immingham.

3.3.46 To explain the purpose of the third objective, an explanation of the need to make best use of available resources is set out with reference to the NPSfP and national and local planning policy.

The need to make best use of available land, water, transport and utility connections

3.3.47 The NPSfP (Ref 3-1) sets out Government policy for ports and at paragraph 3.3.3 sets out that to help meet the requirements of the Government's policies on sustainable development new port infrastructure should *"contribute to local employment, regeneration and development; ensure competition and security of supply; preserve, protect and where possible improve marine and terrestrial biodiversity; minimise emissions of greenhouse gases from port related development; be well designed, functionally and environmentally; be adapted to the impacts of climate change; minimise use of greenfield land; provide high standards of protection for the natural environment; ensure that access to and condition of heritage assets are maintained and improved where necessary; and enhance access to ports and the jobs, services and social networks they create, including for the most disadvantaged."*

3.3.48 National and local planning policy provide a framework to deliver development that is sustainable. The NPPF sets out that the planning system has three overarching objectives, economic, social and environmental, that are mutually supportive and collectively achieve sustainable development. Furthermore, the NPPF has a presumption in favour of sustainable development and contains policies that provide the framework to achieve this. Locally, the spatial development strategy of the North East Lincolnshire Local Plan (Ref 3-3) provides the basis for future planning decisions, and promotes sustainable development to *"improve the quality of life, bring forward quality development to meet identified needs and which delivers economic, social and environmental benefits."*

3.3.49 The North East Lincolnshire Local Plan proposals map shows that landside, part of the land identified for the purposes of the Project is located on operational port land. Furthermore, there are two site allocations in the North East Lincolnshire Local Plan located on land identified for the Project: ELR001, a strategic proposed employment allocation for the ports and logistics sector on Kings Road and ELR025a, a site reserved for long term business expansion. The Project is therefore making effective use of available land by utilising land that has been allocated for that purpose. Section 3.5 provides more detail on the water, transport and utility connections that are available to the Project at the Port of Immingham. A more detailed review of national and local policy and how the

Project is policy compliant will be set out in the documentation prepared to support the application for development consent.

Objective 4 - To minimise adverse impacts on the environment and safeguard the health, safety and amenity of local residents.

3.3.50 To explain the purpose of the fourth objective, an explanation of the need to minimise impacts is provided with reference to the NPSfP and national and local planning policy.

The need to minimise impacts

3.3.51 At Paragraph 4.7.1, the NPSfP requires that projects subject to the Environmental Impact Assessment (EIA) Directive must be accompanied by an Environmental Statement describing *"the aspects of the environment likely to be significantly altered by the project"*. Paragraph 4.7.2 of the NPSfP goes on to state that "*the decision-maker will find it helpful if the applicant also sets out information on the likely significant social and economic effects of the development."* The NPSfP also recognises at Paragraph 4.16.2 that *"Port developments can have direct impacts on health, including increasing traffic, air pollution, dust, odour, polluting water, hazardous waste and pests."*

3.3.52 National and local planning policy also seek to avoid adverse impacts as a result of development. The NPPF contains sections relating to conserving and enhancing the natural and built environment and the need to mitigate and reduce the potential adverse impacts arising from new development. The North East Lincolnshire Local Plan contains strategic policies to safeguard the built, historic and natural environment and more detailed policies that require the consideration of local amenity in terms of noise, air quality, traffic, vibration, dust and visual impact.

3.3.53 The Project will seek to minimise impacts through the process of scheme design and environmental assessment. The likely significant environmental effects of the Project, including noise, air quality, landscape and visual, socio-economics and health, will be assessed and addressed in an Environmental Statement which will be submitted alongside an application for development consent.

Objective 5 - To enhance both the local and regional economy through direct investment in and around the Port of Immingham and by partnering with the supply chain, providing opportunities for training, upskilling, apprenticeships and local employment.

3.3.54 To explain the purpose of the fifth objective, an explanation of the need to support local and regional economic growth is provided. Reference is made to the Government's strategy to achieve net zero, and national and local planning policy.

The need to support local and regional economic growth

3.3.55 The Government's Ten Point Plan (Ref 3-9) sets out the ambition for job creation in implementing measures to achieve net zero stating that *"This Ten Point Plan to get there will mobilise £12 billion of government investment, and potentially three times as much from the private sector, to create and support up to 250,000 green*

jobs." The Ten Point Plan sets out that delivering the growth of low carbon hydrogen could deliver up to 8,000 jobs by 2030 with the potential to unlock 100,000 jobs by 2050 in a high hydrogen net zero scenario. Similarly investing in carbon capture and storage could potentially deliver 50,000 jobs by 2030. The Energy White Paper buildings upon this ambition setting out the aim is to *"establish the UK as a world leader in the deployment of CCUS and clean hydrogen, supporting 60,000 jobs by 2030".*

3.3.56 The Levelling Up White Paper identifies that the UK's transition to net zero is a future factor driving the UK's economic geography. Chapter 1.4.1 recognises that whilst the transition to Net Zero could be disruptive for places that need to undergo the largest transition (given the level of jobs in carbon-intensive industries), it could also be transformative. It states *"the 'Green Industrial Revolution' will require significant investment in new infrastructure and production processes using new technologies".* The White Paper also highlights how many places outside London and the South East have potential to build on their existing strengths such as *"renewable energy, electric vehicle manufacture, Carbon Capture, Utilisation and Storage, and hydrogen"*.

3.3.57 Policy on port development is set out in paragraph 3.3.1 of the NPSfP, where it advises that the Government seeks to *"encourage sustainable port development to cater for long term forecast growth in volumes of imports and exports by sea with a competitive and efficient port industry capable of meeting the needs of importers and exporters cost effectively and in a timely manner, thus contributing to long-term economic growth and prosperity; allow judgments about when and where new developments might be proposed to be made on the basis of commercial factors by the port industry or port developers operating within a free market environment; and ensure all proposed developments satisfy the relevant legal, environmental and social constraints and objectives, including those in the relevant European Directives and corresponding national regulations."*

3.3.58 Paragraph 4.3.2 of the NPSfP recognises that at a regional and local level, *"economic benefits from port developments include regeneration and employment opportunities. As commercial developments, ports can also generate agglomeration effects by bringing together businesses, with varying degrees of mutual interaction, and producing economic benefits over and above those reflected in the value of transactions among those businesses."* Furthermore, at paragraph 4.3.3, the NPSfP also recognises that *"Ports can contribute to the enhancement of people's skills and of technology, as embodied in equipment used by ports and port-related activities, with wider longer-term benefits to the economy."*

3.3.59 Paragraph 81, within Chapter 6 of the NPPF recognises the need for economic growth and productivity, by stating *"planning policies and decisions should help create the conditions in which businesses can invest, expand and adapt. Significant weight should be placed on the need to support economic growth and productivity, taking into account both local business needs and wider opportunities for development".* This approach is aimed at allowing specific areas to build on its strengths, counter weaknesses and address challenges of the future. Paragraph 83 outlines that policies and decisions should *"recognise and*

address the specific locational requirements of different sectors. This includes making provision for clusters or networks of knowledge and data-driven, creative or high technology industries; and for storage and distribution operations at a variety of scales and in suitable accessible locations".

3.3.60 The North East Lincolnshire Local Plan aims to encourage growth and ensure the Borough becomes a sustainable location in the future. The Foreword to the Local Plan sets out that North East Lincolnshire is entering a period of economic growth and that between 2013 and 2032 the Council plan to deliver 8,800 new jobs. It is further stated that a significant proportion of these will be focused around five key economic sectors which includes ports and logistics and renewable energy.

3.3.61 The Project will support national and local growth ambitions through the creation of approximately 700 jobs during the construction stage (marine and terrestrial) and approximately 160 jobs during the operational stage (marine and terrestrial). Refer to **Chapter 23: Socio-economics** for a preliminary assessment of the impact of the Project on employment (including training and apprenticeship opportunities).

3.4 Alternatives

3.4.1 This section has been prepared to address the requirements of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) ('the EIA Regulations') (Ref 3-10). These state at Regulation 14(2)(d) that the Environmental Statement (and a PEI Report) should contain *"a description of the reasonable alternatives studied by the application, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment"*. Paragraph 2 of Schedule 4 'Information for Inclusion in Environmental Statements' of the EIA Regulations further states *"A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects"*.

3.4.2 Paragraph 4.9.1 of the NPSfP highlights that *"in any planning case, the relevance or otherwise to the decision-making process of the existence (or alleged existence) of alternatives to the proposed development is in the first instance a matter of law, detailed guidance on which falls outside the scope of this NPS".* The paragraph also states that *"From a policy perspective this NPS does not contain any general requirement to consider alternatives or to establish whether the proposed project represents the best option."* However, paragraph 4.9.2 outlines that *"applicants are obliged to include in their ES factual information about the main alternatives they have studied. This should include an indication of the main reasons for the applicant's choice, taking into account the environmental, social and economic effects and including, where relevant, technical and commercial feasibility; and in some circumstances there are*

specific legislative requirements, notably under the Habitats Directive, for the applicant and decision-maker to consider alternatives".

3.4.3 Paragraph 4.9.3 of the NPSfP further states that *"given the public interest in provision of new port infrastructure, the decision-maker should, subject to any relevant legal requirements … which may indicate otherwise, be guided by the following principles when deciding what weight should be given to alternatives"*, including *"the consideration of alternatives in order to comply with policy requirements should be carried out in an proportionate manner; whether there is a realistic prospect of the alternative delivering the same infrastructure capacity (including energy security and climate change benefits) in the same timescale as the proposed development; the decision-maker should not reject an application for development on one site simply because fewer adverse impacts would result from developing similar infrastructure on another suitable site, and it should have regard as appropriate to the possibility that other suitable sites for port infrastructure of the type proposed may be needed for future proposals; alternatives not among the main alternatives studied by the applicant … should only be considered to the extent that the decision-maker thinks they are both important and relevant to its decision".*

3.4.4 The consideration of alternatives and design evolution has been undertaken in context of selecting the location of the proposed jetty and site for hydrogen production facilities with the aim of avoiding and/ or reducing adverse environmental effects (following the mitigation hierarchy of avoid, reduce and, if possible, remedy), while maintaining operational efficiency and cost-effectiveness, and considering other relevant matters such as available land and planning policy.

3.4.5 It is highlighted in paragraph 4.10.3 of the NPSfP that, given the importance which the Planning Act 2008 (Ref 3-11) places on good design and sustainability, *"the decision maker needs to be satisfied that port infrastructure developments are sustainably designed and, having regard to regulatory and other constraints, are as attractive, durable and adaptable ... as they can be"*. The design of the Project will be informed by relevant standards and guidelines for port infrastructure to ensure they are fit for purpose. Opportunities to incorporate sustainable design features into the Project will be identified and incorporated where practicable.

3.4.6 The design of the Project is at a preliminary stage and will continue to evolve up to the point of an application for development consent in response to feedback from statutory consultation and with reference to any ongoing surveys and technical studies. The following paragraphs provide a summary of the preliminary consideration of potential alternatives to meeting the need which has been undertaken to date in respect of the Project.

3.5 Preliminary consideration of alternative sites and jetty locations

3.5.1 The Port of Immingham has been identified as a suitable option to meet the need which has been identified to deliver the following objective, *"To provide essential port infrastructure, capacity and resilience to support the changing strategic needs of the energy sector to support decarbonisation within the Humber*

Industrial Cluster and the Humber Enterprise Zone" Having regard to the wider context relating to decarbonisation and the transition to net zero and these objectives, it is considered that the solution to meeting this need within the Humber estuary can be met via the provision of suitable port infrastructure close to available land in a location that benefits from good links to the strategic road network. The Port of Immingham represents the most suitable location in the Humber for the following reasons:

a. It is an established Port in a central UK location and therefore suitably well connected to import or export green energy vectors into and out of the UK;

b. The Port of Immingham is ideally located to be able to connect to the East Coast carbon capture and storage clusters – Humberside is one of the main industrial decarbonisation regions being developed in the UK and therefore that could connect to the developing CO_2 storage infrastructure. This is a major differentiator for this location over other UK ports when considering the wider use of the Green Energy Terminal;

c. It is a deep water port with sufficient available adjacent space to construct a new jetty which can accommodate large gas transporter vessels;

d. It is in an industrial location away from large conurbations;

e. There is space within the area to accommodate the Associated Development of the green hydrogen production facility in close proximity to the jetty.

3.5.2 Development within the current operational boundaries of the Port of Immingham is constrained by existing infrastructure, including on the marine side by existing jetties and on the landside by both operational buildings and structures and an extensive network of pipelines and other services, both above and below ground. The proposed Immingham Eastern Ro-Ro Terminal Development (IERRT Development) (Planning Inspectorate Ref TR030007) has been accommodated within the port itself by the relatively short jetty requirement (a function of the shallow draft requirement of the related vessels) and adjacent landside requirements which do not require extensive pipework or other services. There is no spare capacity on the existing deep water jetties to facilitate the Green Energy Terminal.

3.5.3 In order to develop a new deep water jetty to support the import and export of liquid bulk products associated with the Net Zero agenda, it was therefore necessary to locate the jetty outside the existing operational port site, but as close to it as possible to benefit from the existing supporting infrastructure and port services, whilst also with sufficient land to support the establishment of a new pipeline corridor and terrestrial storage and production facilities.

3.5.4 This development requires deep-water berths and a deep-sea channel to accommodate vessels with up to a 14m draught (depth below water level). Given these factors, the preferred jetty location lies to the immediate east of the Immingham Oil Terminal Jetty, as the berths need to be close to the eastern extent of the Port since the deep-water channel extends further away from the south bank of the estuary further east of this point. A jetty location further east would significantly increase the length of the jetty required and it would extend further into the estuary. In addition, the chosen location places the jetty outside

the widest intertidal areas, reduces the capital dredge required to provide the larger western berth (Berth 1), eliminates the need for a capital dredge for the smaller eastern berth (Berth 2) and should minimise the requirements for ongoing maintenance dredging.

3.5.5 The proposed jetty location, just to the east of the existing boundary of the Port, is therefore considered to be the most suitable, given:

a. The need to reach the deep-water channel and minimise interfaces with other vessels;

b. The need for space on the adjacent land side to support a pipeline corridor, storage and production facilities; and

c. The need to make best use of existing infrastructure and services and to facilitate the location of the Associated Development in close proximity to the jetty.

3.5.6 As set out in the NPSfP, ports are developed in response to customer demand, which in turn are influenced by wider matters such as Government legislation and policy. In this case, Air Products wish to develop a green hydrogen production facility (the Associated Development) which aligns with the Government's ambition to deliver 10GW of low carbon hydrogen by 2030. In summary, the characteristics of the Port of Immingham are considered suitable for the location of the Associated Development for the following reasons:

a. The Port is a deep water port that could facilitate the import of green ammonia using the very large gas carrying vessels that would be used.

b. The Port is located in an area that is already industrial in nature with a limited residential population in and adjacent to the Site.

c. The Port has good access to the existing road network which is suitable for HGVs and is within close proximity to main roads with good connectivity to the wider strategic road network. This will facilitate onward transport and the distribution of green hydrogen to customers in the UK from this central location.

3.5.7 A suitable location for the Associated Development within and around the Port was identified taking into account available space, the Port's existing development plans, ground conditions, presence of existing structures and services including existing transport corridors, proximity to residential conurbations, access, and proximity to the jetty. The two plots of land identified as the proposed location of the Associated Development were selected as the most suitable for the following reasons:

a. Availability of sufficient area of predominantly brownfield land for the Associated Development including land for terrestrial pipelines to join with the pipelines on the jetty trestle;

b. The west site is allocated for employment use (B1[4], B2, B8) in the North East Lincolnshire Local Plan. A green hydrogen production facility would be classified as B2 use, comprising development that would be suitable on this site;

c. Proximity to the jetty to minimise onshore transport distances for ammonia, for safety reasons; and

d. Local access to existing gas and grid connections.

3.6 Consideration of alternative jetty layouts

3.6.1 Alternative jetty layouts are being developed but these all sit within the parameters defined for the Nationally Significant Infrastructure Project which are being assessed as part of the EIA process. All options involve a jetty in the form of a trestle supported on a series of groups of piles leading to up to two berths capable of accommodating ships of different storage capacities, located in the existing deep water channel.

3.6.2 The jetty deck itself would comprise either steel or concrete decks and as with the final layout, this would be subject to future design.

3.6.3 In order to ensure a robust assessment of the likely significant environmental effects of the Project, the EIA is being undertaken adopting the principles of the 'Rochdale Envelope' approach where appropriate. This involves assessing the maximum (or where relevant, minimum) parameters for the elements where flexibility needs to be retained (dimensions or operational modes for example). As such, this PEI Report represents a reasonable worst-case assessment of the potential impacts of the Proposed Development at its current stage of design.

3.7 Consideration of alternative technologies for hydrogen production

3.7.1 The need for a green hydrogen production facility was identified as an essential part of the Project at an early stage, to align to the Government's ambition to deliver 10GW of low carbon hydrogen by 2030 in order to help decarbonise the UK transport sector.

3.7.2 Large scale global deployment of green ammonia is emerging as the safest and most efficient way to transport bulk quantities of green hydrogen from world locations where sustainable solar and wind energies are significantly more available than in the UK. While transport of green hydrogen could be achieved in other ways, such as direct shipping of hydrogen, the transport risks, costs and scale achievable make alternative transport methods less viable and more hazardous.

[4] The B1 use class no longer exists and has been replaced by Eg(i)(ii)(iii) as set out in The Town and Country Planning (Use Classes) Order 1987 (as amended).

3.7.3 A production facility to subsequently produce and temporarily store green hydrogen from the ammonia is therefore required and there are limited alternative technologies to facilitate this. The technology proposed is considered to represent that with the lowest environmental impact, the highest efficiency and is the most technically mature technology available.

3.7.4 The final decision has not yet been made on the detailed design of the hydrogen production facility. Therefore, the design of the Project at this stage incorporates a degree of flexibility in the dimensions and configurations of buildings and structures to allow for the final detailed design.

3.8 The Do Nothing alternative

3.8.1 The do nothing alternative would mean that a UK first of a kind Green Energy Terminal including facilities to enable production of green hydrogen from ammonia would not be developed, meaning that a key development to assist the UK in realising net zero obligations would not be brought forward.

3.8.2 For these reasons the Do Nothing scenario is not considered appropriate.

3.9 Summary and Conclusion

3.9.1 The Project would directly support the aims of the Government's decarbonisation strategy and 2050 net zero obligations through the provision of infrastructure to support the energy sector in producing clean energy, specifically hydrogen production and CCS. The Project also helps to improve Britain's energy security and support the Levelling Up agenda.

3.9.2 The preliminary conclusion is that the preferred solution to the need which has been identified is the provision of new port infrastructure and landside facilities at the Port of Immingham. The Port is deemed the most appropriate site for the development of a Green Energy Terminal in the Humber, given its location, access to deep water and proximity to the UK's largest industrial cluster in the Humber. The Project will seek to minimise adverse effects and make effective use of appropriately designated available land.

3.9.3 The form and approach to the Project has been considered, taking into account environmental effects, alongside other factors such as technical and commercial feasibility. The design will continue to evolve following consultation and the final Rochdale Envelope design will be assessed in the ES submitted as part of the DCO Application.

3.10 References

Ref 3-1 Department for Transport (2012). The National Planning Policy Statement for Ports.

Ref 3-2 Ministry of Housing, Communities & Local Government (2021) National Planning Policy Framework

Ref 3-3 North East Lincolnshire Council (2018). North East Lincolnshire Local Plan.

Ref 3-4 Department for Business, Energy & Industrial Strategy (2020) Energy white paper: Powering our net zero future

Ref 3-5 Department for Business, Energy & Industrial Strategy (2022) UK hydrogen strategy

Ref 3-6 Department of Energy & Climate Change (2011). Overarching National Policy Statement for Energy (EN-1)

Ref 3-7 Department for Business, Energy & Industrial Strategy (2022) British energy security strategy

Ref 3-8 Department for Levelling Up, Housing and Communities (2022) Levelling Up the United Kingdom

Ref 3-9 Department for Business, Energy & Industrial Strategy (2020) The ten point plan for a green industrial revolution

Ref 3-10 The Stationery Office Limited (2017). The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

Ref 3-11 The Stationery Office Limited (2008). Planning Act 2008.

3.11 Abbreviations and Glossary of Terms

Table 3.1: Glossary and Abbreviations

Term	Acronym	Meaning
Associated British Ports	ABP	One of the UK's leading and best-connected ports groups, owning and operating 21 ports across England, Wales and Scotland.
Ammonia	NH_3	Ammonia is a compound of Nitrogen and Hydrogen.
Carbon Capture and Storage	CCS	The process of capturing carbon before it enters the atmosphere.
Carbon Capture, Usage and Storage	CCUS	The process of capturing carbon dioxide CO_2 emissions from fossil power generation and industrial processes for storage deep underground or re-use.
Carbon Dioxide	CO_2	A colourless, odourless gas produced by burning carbon and organic compounds and by respiration.
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
Gigawatt	GW	A unit of power equal to one billion watts.
Health and Safety Executive	HSE	The Health and Safety Executive is a UK government agency responsible for the encouragement, regulation and enforcement of workplace health, safety and welfare.
Heavy Goods Vehicle	HGV	A large truck for transporting goods.
Immingham Eastern Ro-Ro Terminal	IERRT	The proposed ro-ro facility.

Term	Acronym	Meaning
Immingham Green Energy Terminal	IGET	A multi-user liquid bulk jetty, located on the eastern side of the Port of Immingham,
Liquefied Natural Gas	LNG	Liquefied natural gas is natural gas that has been cooled to a liquid state (liquefied), for shipping and storage.
Marine Management Organisation	MMO	The Marine Management Organisation is an executive non-departmental public body in the United Kingdom established under the Marine and Coastal Access Act 2009, with responsibility for English waters.
National Planning Policy Framework	NPPF	A planning framework which sets out the Government's planning policies for England and how these are expected to be applied.
National Policy Statement for Ports	NPSfP	The National Policy Statement for Ports provides the framework for decisions on proposals for new port development.
Preliminary Environmental Information	PEI	The information referred to in Part 1 of Schedule 4 of the EIA Regulations that has been reasonably compiled by the applicant and is reasonably required to assess the environmental effects of a project.
Roll on-roll off	Ro-ro	A design to allow vehicles to drive on and drive off ships.
Transport & Storage	T&S	-
United Kingdom	UK	-

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 4: Legislative and Consenting Framework

Associated British Ports

Document History

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Table of contents

Tables

4 Legislative and Consenting Framework

4.1 Introduction

4.1.1 This chapter provides a summary of the key legislation, policy and guidance against which the Project will be assessed, and which have been considered when defining the scope of the Environmental Impact Assessment (EIA). Where specific aspects of these policies are directly relevant to specific environmental topics, these are addressed further in **Chapters 6 to 24** of the Preliminary Environmental Information (PEI) Report.

4.2 Withdrawal of the UK from the EU

4.2.1 UK legislation is influenced by a variety of international agreements (including European Union (EU) directives, regulations and agreements), which are outlined in this chapter. Following the UK leaving the EU under the terms of the European Union (Withdrawal Agreement) Act 2020 (Ref 4-1) (the 'Withdrawal Act'), broadly, EU-derived domestic legislation and certain EU legislation continue to have effect in domestic law.

4.2.2 In exercise of the powers in the Withdrawal Act, the Government made The Environmental Assessments and Miscellaneous Planning (Amendment) (EU Exit) Regulations 2018 (Ref 4-2). These regulations provided for the The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (Ref 4-3) to be amended to ensure they functioned correctly after the UK exited the EU. In particular, the amendments updated references to the EIA Regulations (Ref 4-3) to EU law, Member States and related terms to reflect the UK leaving the EU. The regulations do not make substantive changes to the way the EIA regime operates following the UK leaving the EU.

4.3 Legislation

The Planning Act 2008

4.3.1 The *Planning Act 2008* (herein known as 'the PA2008') (Ref 4-7) is the primary legislation that establishes the legal framework for applying for, examination and determination of applications for Development Consent Orders (DCOs) for Nationally Significant Infrastructure Projects (NSIPs). As set out in **Chapter 1: Introduction** the Project is defined as an NSIP under s14(1)(j) and under Part 3, s24(2) and s24(3)(c) of the PA 2008. A set of regulations prescribe further detail on specific matters. Of particular relevance to the PEI Report are The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 and Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

4.3.2 Section 120 of the PA2008 (Ref 4-7) allows other types of consents to be included in a DCO. At this stage, consideration is being given to the requisite consenting and approval processes to be included within the DCO and further information on this is provided in **Section 4.6**. As part of the EIA process, pre-application discussions will be held with relevant stakeholders to seek to agree a

position with them on which legislation/consents can/will be disapplied through the DCO.

The EIA Regulations

4.3.3 The requirement for an EIA originates from the EU Council *Directive 85/337/EEC* on the assessment of the effects of certain public and private projects on the environment (Ref 4-8) (the 'EIA Directive) (as amended by *Directive 2011/92/EU* (Ref 4-9) and *2014/52/EU* (Ref 4-10). This is directly transposed into English law for NSIPs by the EIA Regulations (Ref 4-3).

4.3.4 The EIA Regulations (Ref 4-3) identify which projects are likely to have significant environmental effects and would therefore require an EIA, and as described in **Chapter 1: Introduction**, the Project has been identified as an EIA Project. The EIA Regulations (Ref 4-3) also set out a procedure for assessing, consulting and informing the decision-making process for such projects and require the provision of an ES, which would be submitted alongside the DCO application for the Project.

4.3.5 Further details on the approach to the EIA are outlined in **Chapter 5: EIA Approach**.

Habitat Regulations Assessment

4.3.6 In accordance with Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive') (Ref 4-4) and Directive 2009/147/ES of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (the 'Birds Directive') (Ref 4-5), a network of protected sites has been designated by EU member states for the protection of Europe's most valuable and threatened habitats and species. These areas are known as European sites. The Conservation of Habitats and Species Regulations 2017 (SI 2017 No. 1012) (the 'Habitats Regulations') transpose the EU Directives into UK law (Ref 4-6) and remain in place following the UK's exit from the EU.

Water Framework Directive

4.3.7 The Water Framework Directive (WFD), EC Directive 2000/60/EC (Ref 4-23) aims to protect and enhance the quality of the water environment across all European Union (EU) member states. England and Wales have adopted the WFD as national law by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref 4-24). Following the departure of the United Kingdom from the European Union these Regulations continue to apply until they are revoked or superseded by new legislation.

4.3.8 The WFD takes a holistic approach to the sustainable management of water by considering the interactions between surface water, groundwater and water-dependent ecosystems. Ecosystem quality is evaluated according to interactions between biological, physico-chemical and hydromorphological elements (or 'Quality Elements').

4.4 Policy Context

National Policy Statements

4.4.1 Under the PA2008 (Ref 4-7), the national policy framework for examining and determining applications for a DCO is provided by National Policy Statements (NPSs). NPSs are produced by the UK Government to cover the energy, transport, water, waste water and waste sectors and comprise the Government's objectives for the development of NSIPs within each sector.

4.4.2 Section 5 of the PA2008 allows the Secretary of State (SoS) to designate NPSs setting out national policy in relation to the types of NSIP listed at Section 14 of the PA2008.

4.4.3 Section 104(2)(a) of the PA2008 sets out that in deciding an application, the Secretary of State must have regard to any national policy statement which has effect in relation to the development. The relevant NPS that applies to this Project is the National Policy Statement for Ports, designated in January 2012.

4.4.4 Section 104(2)(aa-d) of the PA2008 sets out other documents that the SoS must have regard to when deciding an application for development consent. This includes the appropriate marine policy documents, any local impact report submitted by a relevant local authority, any relevant matters prescribed in relation to the Project and any other matters that the SoS thinks are both 'important and relevant' to the decision.

4.4.5 In the case of the Project, other matters that are important and relevant include recent and relevant UK Government energy and climate change policy including national infrastructure plans and assessments. Other matters that the SoS thinks are both important and relevant may include the policies within the National Planning and Policy Framework (NPPF) (Ref 4-15), Planning Practice Guidance (PPG) (Ref 4-18) and local development plan documents (DPD) including the North East Lincolnshire Local Plan.

4.4.6 Section 104 (3-8) of the PA2008 (Ref 4-7) requires the SoS to determine applications for NSIPs in accordance with the relevant NPS unless this would:

a. lead to the UK being in breach of its international obligations;

b. be in breach of any statutory duty that applies to the SoS;

c. be unlawful;

d. result in the adverse impacts of the development outweighing the benefits; or

e. any condition prescribed for deciding an application otherwise than in accordance with the NPSfP is met.

4.4.7 Each technical chapter of the PEI Report refers to the policies from the NPSs that are relevant to the assessment of the environmental effects reported within that chapter.

National Policy Statement for Ports

4.4.8 The *National Planning Policy Statement for Ports* (NPSfP) (Ref 4-11) provides the framework for decisions on proposals for new port development. The NPSfP applies to the Project by virtue of section 104(2)(a) of the PA2008.

4.4.9 The NPSfP (Ref 4-11) highlights the Government's recognition of the essential role ports perform in the national economy and the need for new infrastructure. The DCO application will set out how the Project complies with the policy contained within the NPSfP (Ref 4-11).

4.4.10 In particular, Section 3 'Government Policy and the Need for New Infrastructure' recognises the vital role that ports play in the import and export of energy supplies. Section 4 'Assessment Principles' of the NPSfP (Ref 4-11) sets out the key considerations the decision maker should take into account when making decisions on port developments. Section 5 'Generic Impacts' of the NPSfP (Ref 4-11) sets out general impacts relating to port development, split by topic.

4.4.11 The NPSfP have been considered in detail within **Chapter 3: Need and Alternatives**.

UK Marine Policy Statement

4.4.12 The *UK Marine Policy Statement* (MPS) (Ref 4-12) provides the framework for preparing Marine Plans and is key when making decisions directly affecting the marine environment. It contributes to the achievement of sustainable development in the UK marine area. The MPS applies to the Project by virtue of section 104(2)(aa) of the PA2008.

4.4.13 Paragraph 2.1.1 of the MPS (Ref 4-12) states that the UK vision for the marine environment is for "…*clean, healthy, safe, productive and biologically diverse oceans and seas*".

4.4.14 The MPS (Ref 4-12) provides the high-level policy context within which national and sub-national Marine Plans would be developed, ensuring that marine resources are used in a sustainable way in line with high level marine objectives to:

a. Promote sustainable economic development.

b. Enable the UK's move towards a low-carbon economy, in order to mitigate the causes of climate change and ocean acidification and adapt to their effects.

c. Ensure a sustainable marine environment which promotes healthy, functioning marine ecosystems and protects marine habitats, species and our heritage assets.

d. Contribute to the societal benefits of the marine area, including the sustainable use of marine resources to address local social and economic issues.

4.4.15 The process of marine planning must contribute to the achievement and integration of these policy objectives.

East Inshore and East Offshore Marine Plans

4.4.16 The *East Inshore and East Offshore Marine Plan* (Ref 4-17), together with the Marine Policy Statement, underpin a new planning system for England's seas. This was adopted in April 2014 and provides a clear approach to managing the East Inshore and East Offshore areas, its resources and the activities and interactions that occur in this area. The East Inshore and East Offshore Marine Plan applies to the Project by virtue of section 104(2)(aa) of the PA2008.

4.4.17 The marine elements of the Project are located within the East Inshore Marine Plan. Relevant adopted policies to the Project are detailed in **Table 4.1**.

Table 4.1 East Inshore and East Offshore Adopted Marine Plan

Policy	Summary
Policy EC1	Economic Benefits
Policy EC2	Employment Benefits
Policy EC3	Offshore Wind and Energy Generation
Policy SOC2	Heritage Assets
Policy SOC3	Terrestrial and Marine Character
Policy ECO1	Cumulative Effects
Policy ECO2	Release of Hazardous Substances
Policy BIO1	Biodiversity Protection
Policy BIO2	Biodiversity and Geological Enhancement
Policy MPA1	Marine Protected Area network
Policy CC1	Climate Change
Policy CC2	Minimising Carbon Emissions
Policy GOV2	Co-existence in the Marine Environment
Policy GOV2	Displacement and Mitigation
Policy DEF1	Ministry of Defence Danger and Exercise Areas
Policy PS3	Ports and Shipping
Policy DD1	Dredging and Disposal Areas
Policy FISH1	Fishing Activity
Policy FISH2	Impacts on Fish Population

Policy	Summary
Policy AQ1	Sustainable Aquaculture Development Sites
Policy TR1	Tourism and Recreation during construction and operation
Policy TR2	Recreational Activity

The Energy White Paper: Powering our Net Zero Future

4.4.18 The *Energy White Paper: Powering our Net Zero Future* (Ref 4-13) was presented to Parliament in December 2020. At its core is a commitment to achieve net zero and tackle climate change, and a clear commitment from the UK Government to invest in new clean energy, with a target of 5GW of low-carbon hydrogen production capacity by 2030 being set. The Energy White Paper applies to the Project by virtue of it being important and relevant under section 104(2)(d) of the PA2008.

British Energy Security Strategy

4.4.19 The UK government published the *British Energy Security Strategy* (Ref 4-14) in April 2022, which focuses on providing secure, clean and affordable British energy for the long term. The British Energy Security Strategy applies to the Project by virtue of it being important and relevant under section 104(2)(d) of the PA2008.

4.4.20 It states that the UK is “going to produce vastly more hydrogen, which is easy to store, ready to go whenever we need it, and is a low carbon superfuel of the future”. It also outlines that the UK Government “fully support hydrogen as a relatively frictionless way to decarbonise our lives in the near-term” and commits to doubling its hydrogen production ambition to 10GW by 2030.

UK Hydrogen Strategy

4.4.21 The UK Hydrogen Strategy sets out the Government's approach to developing a thriving low carbon hydrogen sector in the UK and the ambition for 5GW of low carbon hydrogen production capacity by 2030. The Strategy recognises that hydrogen comprises a low carbon solution that is critical to the UK’s transition to net zero. The UK Hydrogen Strategy applies to the Project by virtue of it being important and relevant under section 104(2)(d) of the PA2008.

National Planning Policy Framework

4.4.22 The latest version of the National Planning Policy Framework (NPPF) was most recently updated in July 2021 (Ref 4-15). The NPPF applies to the Project by virtue of it being important and relevant under section 104(2)(d) of the PA2008.

4.4.23 The NPPF sets out the Government’s planning policies for England and how these are to be applied and is a material consideration in planning decisions. Paragraph 5 of the NPPF (Ref 4-15) states that whilst it does not contain specific policies for NSIPs, it may be considered as 'important and relevant' in the

decision-making process in accordance with section 104 of the PA2008 (Ref 4-7). It sets out the Government's planning policies for England and how they should be applied. At the heart of the NPPF is a presumption in favour of sustainable development and to deliver this, the framework sets out the Government's economic, environmental and social planning policies for England and how these should be applied.

4.4.24 The NPPF is supported by the *National Planning Practice Guidance* (NPPG) (Ref 4-18), which is a web-based resource.

4.4.25 Paragraph 7 of the NPPF is clear that the purpose of the planning system is to contribute to the achievement of sustainable development and that the policies that are set out in the Framework, taken as a whole, constitute the Government's view of what sustainable development in England means in practice. Paragraph 8 goes on to identify three overarching objectives to achieving sustainable development:

a. An economic objective – to help build a strong, responsive and competitive economy, by ensuring that sufficient land of the right types is available in the right places and at the right time to support growth, innovation and improved productivity; and by identifying and coordinating the provision of infrastructure.

b. A social objective – to support strong, vibrant and healthy communities, by ensuring that a sufficient number and range of homes can be provided to meet the needs of present and future generations; and by fostering well-designed, beautiful and safe places, with accessible services and open spaces that reflect current and future needs and support communities' health, social and cultural well-being.

c. An environmental objective – to protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.

4.4.26 Sections of the NPPF that are of particular relevance to the scope of the EIA presented in **Chapters 6 to 24** of this PEI Report include:

a. Section 2 – Achieving sustainable development.

b. Section 6 – Building a strong, competitive economy.

c. Section 11 – Making effective use of land.

d. Section 12 – Achieving well designed places.

e. Section 14 – Meeting the challenge of climate change, flooding and coastal change.

f. Section 15 – Conserving and enhancing the natural environment.

g. Section 16 – Conserving and enhancing the historic environment.

4.4.27 Relevant content from the NPPF (Ref 4-15) and NPPG (Ref 4-18) has been referenced directly in the environmental topic chapters of this PEI Report.

4.5 Local Planning Policy

North East Lincolnshire Local Plan 2013 to 2032

4.5.1 Local planning policy contained within Development Plans for the local authority administrative areas can be material considerations in the determination of NSIP applications and provide an indication of local environmental sensitivities.

4.5.2 The Project falls within the administrative boundary of North East Lincolnshire Council (NELC). NELC formally adopted the *North East Lincolnshire Local Plan 2013 to 2032* (the Plan) (Ref 4-16) in 2018 and relevant adopted policies are listed in **Table 4.2**. The Plan applies to the Project by virtue of it being important and relevant under section 104(2)(d) of the PA2008.

Table 4.2 North East Lincolnshire Local Plan Policies

Policy	Summary
Policy 6	Infrastructure
Policy 7	Employment Allocations – Operational Port Areas
Policy 9	Habitat Mitigation – South Humber Bank
Policy 11	Skills and Training
Policy 22	Good Design in New Developments
Policy 31	Renewable and Low Carbon Infrastructure
Policy 32	Energy and Low Carbon Living
Policy 33	Flood Risk
Policy 34	Water Management
Policy 36	Promoting sustainable transport
Policy 39	Conserving and Enhancing the Historic Environment
Policy 40	Developing a Green Infrastructure Network
Policy 41	Biodiversity and Geodiversity
Policy 42	Landscape
Policy 43	Green Space and Recreation

4.6 Other Consents and Notifications

Disapplication of Legislative Provisions

4.6.1 Consideration is being given to the requisite consenting and approval processes to be included within the DCO. As part of the EIA process, pre-application discussions will be held with relevant stakeholders to seek to agree a position with them on which legislation/consents can be disapplied through the DCO.

4.6.2 At this stage in the Project development process, the requirement to seek a deemed marine licence within the DCO, as a marine licence granted under the Marine and Coastal Access Act, has been identified. Section 149A of the PA2008 (Ref 4-7) enables DCOs for projects which affect the marine environment to include provisions which deem marine licences to have been granted subject to specified conditions. The Project would include works below Mean Water High Springs (MWHS), including a capital dredge and disposal of the arisings from the capital dredge at sea, subject to there being no contamination, and therefore the Applicant will be seeking a deemed marine licence, in consultation with the Marine Management Organisation (MMO), as part of the DCO.

4.6.3 Maintenance dredging will also be required. The Applicant has an existing marine licence (L/2014/00429/4) for maintenance dredging of the Port. This licence will need to be renewed by the end of 2025 and extended to include the area for maintenance dredging for the Project. A preliminary assessment of the potential environmental impacts associated with both the proposed capital dredge and the additional maintenance dredge and disposal requirements has been undertaken in this PEI Report and will be finalised in the Environmental Statement (ES).

Other Consents and Notifications

4.6.4 Given the nature of the Project, there will be a requirement to obtain a range of other consents and approvals outside of the DCO process.

4.6.5 At this stage, a likely requirement for the following consents and approvals has been identified:

a. Protected species licences (The Conservation of Habitats and Species Regulations 2017) (Ref 4-19).

b. Hazardous Substances Consent (The Planning (Hazardous Substances) Regulations 2015) (Ref 4-20).

c. Control of Major Accidents and Hazards (COMAH) notification (The Control of Major Accident Hazardous Regulations (Ref 4-21).

d. An Environmental Permit for the processing facilities (The Environmental Permitting (England and Wales) Regulations 2016 (Ref 4-22).

4.6.6 In examining and determining the DCO application, the Examining Authority and the SoS should assume these processes will be completed as per the relevant prescribed process and consents forthcoming.

4.7 Summary

4.7.1 The designated ports NPS (Ref 4-11), and the MPS (Ref 4-12) represent the principal policy documents against which an application for the Project would be determined. They set out a number of generic impacts and considerations relevant to the scoping of projects, and assessment principles with which applications for NSIP are expected to comply.

4.8 References

Ref 4-1 The Stationery Office Limited (2020). European Union (Withdrawal Agreement) Act 2020.

Ref 4-2 The Stationery Office Limited (2018). The Environmental Assessment and Miscellaneous Planning (Amendment) (EU Exit) Regulations 2018.

Ref 4-3 The Stationery Office Limited (2017). The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

Ref 4-4 The European Community (1992). Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive')

Ref 4-5 European Parliament (2009). Directive 2009/147/EC of the European Parliament and of the Council.

Ref 4-6 UK Government (2017). The Conservation of Habitats and Species Regulations 2017.

Ref 4-7 The Stationery Office Limited (2008). Planning Act 2008.

Ref 4-8 European Commission (1985). Council Directive of 27 June 1985 of the assessment of the effects of certain public and private projects on the environment (85/ 337/ EEC).

Ref 4-9 European Commission (2011). Directive 2011/ 92/ EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment.

Ref 4-10 European Commission (2014). Directive 2014/ 52/ EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/ 92/ EU on the assessment of the effects of certain public and private projects on the environment.

Ref 4-11 Department for Transport (2012). The National Planning Policy Statement for Ports.

Ref 4-12 The Stationery Office Limited (2011). UK Marine Policy Statement.

Ref 4-13 Department for Business, Energy & Industrial Strategy (2020). Powering our Net Zero Future.

Ref 4-14 Department for Business, Energy & Industrial strategy (2022). British energy security strategy.

Ref 4-15 Ministry of Housing, Communities and Local Government (2021). National Planning Policy Framework.

Ref 4-16 North East Lincolnshire Council (2018). North East Lincolnshire Local Plan.

Ref 4-17 Maritime Management Organisation (2016). East Inshore and East Offshore Marine Plans.

Ref 4-18 Ministry of Housing, Communities and Local Government (2021). Planning Practice Guidance.

Ref 4-19 The Stationery Office Limited (2017). The Conservation of Habitats and Species Regulations 2017.

Ref 4-20 The Stationery Office Limited (2015) The Planning (Hazardous Substances) Regulations 2015.

Ref 4-21 The Stationery Office Limited (2015) The Control of Major Accident Hazardous Regulations 2015.

Ref 4-22 The Stationery Office Limited (2016) The Environmental Permitting (England and Wales) Regulations 2016.

Ref 4-23 European Commission (2000). The EU Water Framework Directive – Integrated River Basin Management for Europe (2000/60/EC).

Ref 4-24 The Stationery Office Limited (2017). The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.

4.9 Abbreviations and Glossary of Terms

Table 4.3 Abbreviations and Glossary of Terms

Term	Acronym	Meaning
Control of Major Accidents and Hazards	COMAH	Aims to prevent and mitigate the effects of major accidents involving dangerous substances which can cause serious damage/harm to people and/or the environment.
Development Consent Order	DCO	The means of obtaining permission to construct and maintain developments categorised as NSIPs.
Environmental Impact Assessment	EIA	Process used to assess the effects of a project on the environment.
European Union Emissions Trading System	EU ETS	Sets an absolute limit or 'cap' on the total amount of certain greenhouse gases that can be emitted each year by the entities covered by the system.
Marine Management Organisation	MMO	UK Government public body who regulate marine activities.
UK Marine Policy Statement	MPS	The framework for preparing Marine Plans and taking decisions affecting the marine environment
Mean Water High Springs	MWHS	The average throughout the year, of two successive high waters, during a 24-hour period in each month when the range of the tide is at its greatest (Spring tides).
North East Lincolnshire Council	NELC	The local authority of North East Lincolnshire.
National Planning and Policy Framework	NPPF	Sets out the UK government's planning policies for England and how these are expected to be applied.
National Policy Statements	NPS	Set out the government's policy for the delivery of energy infrastructure and provide the legal framework for planning decisions.
National Planning Policy Statement for Ports	NPSfP	Provides the framework for decisions on proposals for new port development.

Term	Acronym	Meaning
Nationally Significant Infrastructure Project	NSIP	Developments that are decided upon by the secretary of State.
Preliminary Environmental Impact	PEI	Sets out the initial impacts and effects from a proposed development.
Secretary of State	SoS	The title typically held by Cabinet Ministers in charge of Government Departments.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 5: EIA Approach

Associated British Ports

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Table of contents

Tables

Appendices

No Appendices

5 EIA Approach

5.1 Environmental Impact Assessment Approach and Scope

5.1.1 This Chapter in this PEI Report has been prepared to satisfy the requirements of Regulation 12 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) ('the EIA Regulations').

5.1.2 In preparing the PEI Report (in line with the EIA Regulations), reference has been made to the following guidance:

a. Planning Inspectorate Advice Note Three: *EIA Consultation and Notification* (Ref 5-1).

b. Planning Inspectorate Advice Note Seven: *Environmental Impact Assessment, Preliminary Environmental Information, Screening and Scoping* (Ref 5-2).

c. Planning Inspectorate Advice Note Nine: *Rochdale Envelope* (Ref 5-3).

d. Planning Inspectorate Advice Note Ten: *Habitats Regulations Assessment* (Ref 5-4).

e. Planning Inspectorate Advice Note Twelve: *Transboundary Impacts* (Ref 5-5).

f. Planning Inspectorate Advice Note Seventeen: *Cumulative Effects Assessment relevant to national significant infrastructure projects* (Ref 5-6).

g. Planning Inspectorate Advice Note Eighteen: *The Water Framework Directive* (Ref 5-7).

5.1.3 Reference has also been made to the Scoping Opinion received from the Secretary of State (SoS) on 10 October 2022 (**Appendix 1.B** PEI Report, Volume IV) and the advice contained within it regarding assessment methodology, topics and presentation of the final ES together with responses received through consultation and engagement. This PEI Report is consistent with the requirements set out in Regulation 14(3) of the Infrastructure Planning (EIA) Regulations 2017.

5.1.4 In response to the Scoping Opinion, the EIA of this Project and this PEI Report include assessments of the following environmental topics:

a. **Chapter 6: Air Quality**.

b. **Chapter 7: Noise and Vibration**.

c. **Chapter 8: Nature Conservation (Terrestrial Ecology)**.

d. **Chapter 9: Nature Conservation (Marine Ecology)**.

e. **Chapter 10: Ornithology**.

f. **Chapter 11: Traffic and Transport**.

g. **Chapter 12: Marine Transport and Navigation**.

h. **Chapter 13: Landscape and Visual Impact**.

i. **Chapter 14: Historic Environment (Terrestrial).**
j. **Chapter 15: Historic Environment (Marine).**
k. **Chapter 16: Physical Processes**.
l. **Chapter 17: Marine Water and Sediment Quality**.
m. **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage**.
n. **Chapter 19: Climate Change**.
o. **Chapter 20: Materials and Waste**.
p. **Chapter 21: Ground Conditions and Land Quality**.
q. **Chapter 22: Major Accidents and Disasters**.
r. **Chapter 23: Socio-Economics**.
s. **Chapter 24: Human Health and Wellbeing**.
t. **Chapter 25: Cumulative and In-Combination Effects**.

Overarching Approach

5.1.5 EIA is a process for identifying the likely significant environmental effects (positive and negative) of a proposed project to inform the decision-making process for development consent to be granted.

5.1.6 EIA aims to be a systematic, analytical, impartial, consultative and iterative process of identifying, evaluating and mitigating the likely significant environmental effects of a project. It promotes the early identification and evaluation of the likely significant effects and enables appropriate mitigation (that is, measures to avoid, reduce or offset significant adverse effects) to be identified and incorporated into the design of the development, or commitments to be made to environmentally sensitive construction methods and practices.

5.1.7 Typically, a number of design iterations take place in response to environmental constraints being identified and consultee feedback received during the EIA process prior to the final design being defined. This will be particularly important for the Project as the design and layout are still being refined, and changes may be made following submission of this PEI Report.

5.1.8 Where the approach has moved on from the Scoping Opinion this is explained in this PEI Report and Consultees are encouraged to provide feedback on how the scope has developed and is now defined.

5.1.9 The approach taken in preparation of this PEI Report has been informed by the Planning Inspectorate's Advice Note Seven (Ref 5-2) and reflects that the EIA Regulations (Ref 5-8) require an ES to focus on aspects of the environment likely to be subject to significant effects. Accordingly, this PEI Report, where appropriate, scopes out aspects/matters from further assessment with suitable justification provided. This streamlines the assessment to focus on key likely significant effects and ensures the assessment is proportionate in accordance with the Institute of Environmental Management and Assessment's (IEMA) Delivering Proportionate EIA (Ref 5-9) guidance document.

5.1.10 For the purposes of the EIA, the full capacity of the jetty, of up to 400 vessel calls per year, is assessed. Similarly the landside infrastructure to import ammonia from the jetty, store the ammonia and cover the ammonia into green hydrogen (see **Chapter 2: The Project)** is also assessed for the fully built operational development (all six phases).

5.2 PEI Report

5.2.1 This PEI Report presents a description of the Project and its likely significant environmental effects during construction, operation (including maintenance where relevant) and decommissioning (of the hydrogen production facility), based on the preliminary environmental information available at the time of its publication. The EIA process will continue and will be fully reported in the ES that will accompany the Development Consent Order (DCO) Application. It also details measures to avoid or reduce such effects and the alternatives considered.

5.2.2 This PEI Report summarises the outcome to date of the following ongoing EIA activities:

a. Scoping opinion.

b. Establishing baseline conditions.

c. Consultation with statutory and non-statutory consultees.

d. Consideration of relevant local, regional and national planning policies, guidelines and legislation relevant to the EIA.

e. Consideration of technical standards for the development of significance criteria and specialist assessment methodologies.

f. Design review.

g. Review of previous environmental studies, publicly available information, desktop studies and online databases.

h. Physical surveys and monitoring.

i. Desk-top studies.

j. Modelling and calculations.

k. Reference to current guidance.

5.2.3 These activities enable the prediction of impacts in relation to the current and future baseline, and a prediction based on the information available of the likely significance of effects on environmental receptors.

5.2.4 The term ‘impact’ refers to changes arising from the Project, whereas the term ‘effect’ is used to describe the result of the impact on a receptor.

5.2.5 Each technical chapter within this PEI Report (**Chapters 6 to 24**) follows the same structure for ease of reference, which is:

a. Introduction.

b. Approach to assessment.

c. Baseline conditions both existing and future

d. Potential impacts and effects.

e. Design, mitigation and enhancement measures.

f. Residual effects.

g. Summary of preliminary assessment.

5.3 Rochdale Envelope Parameters and Managing Design Uncertainty

5.3.1 With any large infrastructure project, such as Immingham Green Energy Terminal (IGET), the project design will continue to evolve to respond to design challenges, stakeholder views and the ongoing findings of the EIA process. The design will continue to develop in the lead-in to the application for development consent and will be further refined up until the start of construction. In order to account for these possible future changes and particularly for post consent change, in the EIA process (and therefore in the PEI Report) it is necessary to make a number of assumptions about what is termed a 'reasonable worst-case'.

5.3.2 Design uncertainty is addressed within the EIA and the PEI Report by adopting a precautionary approach to identifying significant environmental effects, through the establishment of a series of maximum development extents known as a 'Rochdale Envelope'.

5.3.3 The Rochdale Envelope arises from UK case law (Ref 5-10). It is an established principle that allows a number of parameters to be set to establish and envelope within which the project will be delivered so as to limit the potential scope of a project. Its adoption allows robust EIA to be undertaken by defining a reasonable worst-case scenario that decision-makers can consider when determining the acceptability or otherwise, of the environmental effects of a development project.

5.3.4 The principle is founded on the assumption that, as long as the technical and engineering design of a project fall within the limits of the envelope defined by parameters (including geographical and technical limits), and the EIA has considered the likely significant effects of a project coming forward within that envelope (based on the reasonable worst-case scenario), then flexibility within those parameters is deemed to be permissible within the terms of any consent granted for the project.

5.3.5 The reasonable worst-case scenario assumes that one or other of the parameters would have a more significant adverse effect than the alternative, and where a range of parameters is provided, the most environmentally detrimental parameter is assessed in the EIA. The worst-case scenario can differ between the environmental topics being assessed, and the environmental resources or receptors potentially affected.

5.3.6 Advice published by the Planning Inspectorate (Ref 5-3) fully endorses the approach of assessing design uncertainty, whilst still meeting the requirements of the EIA Regulations (Ref 5-8).

5.3.7 In line with this approach, parameters will be established across aspects relating to the design and construction of the Project to manage design uncertainty and provide flexibility for deviation where needed. For example, flexibility may be needed to enable minor design refinements to be made during construction by

the appointed contractor within the overall parameters of any consent granted and which would not produce different significant effects to those reported in the Environmental Statement (ES).

5.3.8 This approach to managing uncertainty within defined parameters and limits will ensure that the likely significant environmental effects of the final design or any design changes that may arise post submission of the DCO Application will have been assessed through the EIA.

5.3.9 In certain places the site boundary, as illustrated on **Figure 2.2** (PEI Report, Volume III), may be more extensive than the proposed draft Order Limits which are ultimately applied for within the DCO Application. This is because refinement of project design, e.g. such as for the required pipeline corridors, will continue through to the date of application for development consent.

5.4 Defining Study Areas: Spatial Scope of Assessment

5.4.1 The study area (or 'the spatial scope') for each environmental aspect, the area over which changes to the environment are predicted to occur as a consequence of the Project, depends on the nature of the potential effects and the location of receptors that could be affected. Study areas take account of:

a. The physical area and characteristics of the Project.

b. The nature of the existing and future baseline environment.

c. The manner and extent to which environmental effects may occur.

5.4.2 Each individual technical assessment of this PEI Report (**Chapters 6 to 24**) defines the study area to be considered and provides a rationale to support its selection, including consideration of the current baseline conditions such as the presence of any sensitive features and/or designations within, or adjacent to, the proposed study area. The study area of each assessment may be refined in response to comments from consultees or as a consequence of further assessment work.

5.5 Temporal Scope

5.5.1 The temporal scope covers the time period over which changes to the environment and the resultant effects are predicted to occur, and are typically defined as either being permanent or temporary:

a. Permanent – these are effects that would remain even when the Project is complete, although these effects may be caused by environmental changes that are permanent or temporary.

b. Temporary – these are effects that are related to environmental changes associated with a particular activity and that would cease when that activity finishes.

5.5.2 The assessment has regard to the Project programme and evaluates the environmental effects of the phased approach to construction and operation summarised in **Table 2.1** of **Chapter 2: The Project**. Further information on the phased development of the Project will emerge as the design progresses, and

the Applicant will review this to identify and confirm the worst-case construction and operational scenarios to be modelled and assessed in the EIA.

5.5.3 As stated in **Section 2.1** of **Chapter 2: The Project**, consideration of effects from decommissioning of the Project are considered within the EIA where necessary.

5.6 Characterisation of the Existing and Future Baseline Environment

5.6.1 To assess the potential environmental effects resulting from the Project, it is necessary to first establish the environmental conditions that currently exist within the vicinity of the Order Limits.

5.6.2 Appropriate understanding of the baseline for each technical environmental discipline is being collated through some or all of the following:

a. Review of secondary sources (desk-based, i.e. review of existing documentation and literature; data searches and available data sets such as GroundSure or EnviroCheck).

b. Review of primary baseline studies (field surveys).

c. Stakeholder consultation.

5.6.3 Existing baseline conditions have been defined for each technical assessment topic in **Chapters 6 to 24**, based on desk-based studies and site surveys undertaken to date, where necessary. It is also important to consider future baseline conditions (in the absence of the Project) against which the effects of the Project can be assessed.

5.6.4 The key data sources used to establish baseline conditions are described in each technical assessment chapter of the PEI Report (**Chapters 6 to 24**).

Baseline Conditions (including Future Baseline)

5.6.5 The 'existing baseline' date is 2022 since this is the period in which the baseline studies for the EIA are being undertaken. ‘Future baseline’ conditions are also predicted for each assessment scenario, whereby the conditions anticipated to prevail at a certain point in the future (assuming the Project does not progress) are identified for comparison with the predicted conditions with the Project. This can include the introduction of new receptors and resources into an area, or new development schemes that have the potential to change the baseline, where these constitute ‘committed developments’.

5.6.6 The assessment scenarios that are being considered for the purposes of the EIA (and considered in this PEI Report) are as follows:

a. Existing baseline (2022).

b. Future baseline (No Development) (up to Q2 2025).

c. Construction: construction of the Project could (subject to the necessary consents being granted) potentially start as early as Q2 2025 with the construction of the first berth of the jetty as part of the phase one construction works. Following the completion of Berth 1 infrastructure, the berthing trestle approach linking Berth 1 and Berth 2, including a Berth 2 approach trestle, would be constructed. Following completion of the first phase of the

hydrogen production facility, a further five phases would be constructed incrementally to increase the processing capacity as the market for green hydrogen increases. For the purposes of this PEI Report, a development scenario has been defined for the Project. This scenario is based on a six-phase construction timeline commencing in Q2 of 2025, through to full completion of all phases in 2035 (see **Chapter 2: The Project)**. However, it is important to note that, as with the two jetty berths, there could be pauses between the terrestrial phases depending on demand.

d. Opening and/or operation: assuming an approximate 11-year construction programme followed by a period of commissioning, the Project is unlikely to commence commercial operation before Q4 2027. The assessment years have been chosen by specialists as the reasonable worst-case for each topic.

e. Decommissioning: it is envisaged that the landside elements (the hydrogen production facilities) of the Project would have an operational life of up to approximately 25 years. On this basis, decommissioning activities of these landside elements are currently anticipated to commence after 2060. The marine infrastructure will not be decommissioned.

5.7 Environmental Effects

5.7.1 Environmental effects are the consequence of impacts. By way of example, an impact arising from a new pipeline project could be represented by the loss of mature woodland to accommodate a new section of pipeline and associated maintenance track, the effect (or consequence) of which could be the opening of new views in which this infrastructure becomes a focus point.

5.7.2 For an effect to occur there has to be a pathway between the impact and the resource or receptor.

5.7.3 In the EIA, effects are formulated as a function of the importance, value or sensitivity of an environmental resource or receptor, and the magnitude of impact (or change) predicted. A combination of professional judgement, defined thresholds, established criteria and standards are used in their definition within this PEI Report and will also be used within the ES.

5.7.4 The significance criteria presented in **Section 5.8** are used to report the significance of effects, the assignment of which will rely on reasoned argument, professional judgement, established thresholds and guidelines, and the views of relevant organisations.

5.7.5 Account is taken of the role of environmental mitigation measures, as discussed in **Section 5.9**, in reducing the significance of adverse effects.

5.8 Significance Criteria

5.8.1 For consistency, the methodology described in this section is applied across the assessed environmental topics within this PEI Report to ensure the identified environmental effects are assessed and evaluated in a comparable manner.

5.8.2 Variations from this approach will be applicable to specific environmental topics where other prevailing standards, thresholds and/or established criteria exist that require application. Where this is the case, an outline is provided in the technical assessment chapters (**Chapters 6 to 24**) of this PEI Report.

5.8.3 **Table 5.1** presents the generic guidelines for the sensitivity (or importance/value) of the resource or receptor that are applied within this PEI Report.

Table 5.1 Generic Guidelines for the Assessment of Sensitivity

Sensitivity (or importance/value)	Typical Descriptors
High	The resource or receptor has a very low capacity to accommodate the proposed form of change without fundamentally altering its present character; possesses key characteristics which contribute significantly to the distinctiveness, rarity and character of the site or receptor; is of international or national importance.
Medium	The resource or receptor has a low capacity to accommodate the proposed form of change without significantly altering its present character; possesses key characteristics which contribute significantly to the distinctiveness and character of the site or feature; is of regional or county importance.
Low	The resource or receptor has some tolerance to accommodate the proposed change without detriment to its character; possesses characteristics which are locally significant; is either not designated or is designated at a local or district level.
Very Low	The resource or receptor is generally tolerant and can accommodate the proposed change without detriment to its character; resource or receptor characteristics do not make a significant contribution to local distinctiveness; is not designated.

5.8.4 **Table 5.2** presents the generic magnitude of impact (or change) criteria that are applied within this PEI Report.

Table 5.2 Generic Guidelines for Determining the Magnitude of Impact (or change)

Magnitude of Impact (or change)	Typical Descriptors
High	The total loss or major change/substantial alteration to key elements/features of the current (pre-development) baseline conditions, such that the character/ composition/attributes of the baseline would be fundamentally changed post-development.
Medium	Loss or alteration to one or more key elements/features of the current (pre-development) baseline conditions, such that the character/ composition/attributes of the baseline will be materially changed post-development.

Magnitude of Impact (or change)	Typical Descriptors
Low	Noticeable or small-scale change in character/composition/ attributes of the current (pre-development) baseline conditions. Change arising would be discernible/detectable but not material post-development.
Very Low	Very small-scale change or barely discernible changes in character/composition/attributes of the current (pre-development) baseline conditions post-development.

5.1.2 Having established the magnitude of change and the sensitivity of the receptor, the significance of an effect can be assessed. Development proposals affect different environmental elements to varying degrees and not all of these are of sufficient concern to warrant detailed investigation or assessment within the EIA process. The EIA Regulations (Ref 5-8) identify those environmental resources that warrant investigation as those that are *"likely to be significantly affected by development"* (Schedule 4(4)).

5.8.5 The identification of effect significance typically requires the application of professional judgement; however the overarching significance matrix used in the EIA is shown in **Table 5.3**. The generic definitions that will be used to determine the level of effect significance are shown in **Table 5.4**. Reference is made to:

a. 'Major' effects, which would always be determined as being significant.

b. 'Moderate' effects can be significant based on specific scenarios and professional judgement.

c. 'Minor' or 'negligible' effects, which would always be deemed as 'not significant'.

d. Effects can be beneficial or adverse.

Table 5.3 Generic Significance Evaluation Matrix

		Magnitude of Change			
		Very Low	Low	Medium	High
Sensitivity of Receptor	High	Minor (not significant)	Moderate (potentially significant)	Major (significant)	Major (significant)
	Medium	Minor (not significant)	Minor (not significant)	Moderate (potentially significant)	Major (significant)
	Low	Negligible (not significant)	Minor (not significant)	Minor (not significant)	Moderate (potentially significant)
	Very Low	Negligible	Negligible	Minor	Minor

		Magnitude of Change			
		Very Low	Low	Medium	High
		(not significant)	(not significant)	(not significant)	(not significant)

Table 5.4 Generic Significance of Effect Description

Significance Category	Indicative Description
Major	Very large or large change in environmental conditions. Effects, both negative and positive, which are likely to be important considerations at a national to regional level because they contribute to achieving national or regional objective, or which are likely to result in exceedance of statutory objectives or breaches of legislation. These effects are considered to be very important considerations and are likely to be material in the decision-making process.
Moderate	Intermediate change in environmental conditions. Effects are likely to be important considerations at a regional or local level and important in informing the decision-making process.
Minor	Small change in environmental conditions that are unlikely to be critical in the decision-making process.
Negligible	No discernible change in environmental conditions. An effect that is likely to have a neutral or negligible influence.

5.8.6 In subsequent chapters of this PEI Report the general criteria described above have been made more specific for each environmental topic based on relevant standards and guidelines. Further explanation of the approach to assessing impacts and effects, and the specific criteria to be used for each topic is set out, with any deviation from this standard approach noted.

5.9 Environmental Measures

5.9.1 Consistent with Regulation 14(2)(c) of the EIA Regulations (Ref 5-8), the PEI Report includes a description of the "*measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment*".

5.9.2 For each environmental topic the EIA process systematically identifies impacts and effects and take into consideration environmental measures that the Project would adopt. These environmental measures include avoidance, best practice and design commitments as follows:

a. *Embedded Mitigation Measures:* modifications to the location, design or operation of a development made during the pre-application phase that are an inherent part of the Project and do not require additional action to be taken.

b. *Standard Mitigation Measures:* measures comprising management activities and techniques, which would be implemented during construction of the

Project to limit impacts through adherence to good site practice and achieving legal compliance.

c. *Additional Mitigation Measures:* these comprise measures over and above any embedded and standard mitigation measures, for which the EIA has identified a requirement to further reduce significant environmental effects.

5.9.3 When such measures form an integral part of the Project design (i.e. embedded mitigation and standard mitigation) and/or the approach to its construction, the assessment of likely significant effects only reports the post-mitigation effects within this PEI Report.

5.9.4 Where additional mitigation measures are identified, the PEI Report reports both pre- and post-mitigation effects in order to demonstrate their efficacy in further reducing the significance of effects and will explain how such measures will be secured.

5.9.5 Following the identification of environmental measures, the assessment of effect significance is re-evaluated to determine whether there is likely to be a residual effect and if it remains significant. Residual effects assessed as Moderate or Major after consideration of environmental mitigation measures normally require additional analysis and consultation to further mitigate them, where feasible. Where further mitigation is not possible a significant residual effect may remain.

5.9.6 At ES stage a separate Register of Environmental Actions and Commitments (REAC) document will be prepared to summarise the environmental measures committed to within the ES.

5.9.7 An outline Construction Environmental Management Plan (CEMP) will be prepared and submitted with the DCO Application which will contain the Register of Environmental Actions and commitments (REAC), so far as relevant to construction, as well as other effective, site-specific procedures required during construction, details of identified monitoring and auditing of mitigation as required. This document will then be further developed once the contractor is appointed. A requirement within the DCO will ensure that those measures included in the outline CEMP are legally secured for implementation.

5.10 Cumulative and In Combination Effects

5.10.1 As required by the EIA Regulations, consideration is given to the potential for cumulative and combined effects to arise as a result of the Project.

5.10.2 Cumulative effects are those that accrue over time and space from a number of development activities. The impact of the Project will be considered in conjunction with the potential impacts from other projects or activities which are reasonably foreseeable in terms of delivery. This includes projects for which applications for development consent and/or planning permission have been submitted but have not yet been approved and projects that have planning permission or development consent that are located within a geographical scope where environmental impacts could act together to create a more significant overall effect on a receptor and where sufficient environmental information is available.

5.10.3 In Combination (or Combined) effects are those resulting from a single development, in this case the 'Project', on any one receptor that may collectively cause a greater effect (such as the combined effects of noise and air quality/dust impact during construction on local residents). Cumulative and In Combination effects are discussed in **Chapter 25: Cumulative and In Combination Effects**.

5.11 Transboundary Effects

5.11.1 Initial consideration has been given to Regulation 32 of the Infrastructure Planning (EIA) Regulations 2017 (Ref 5-8) and the Planning Inspectorate *Advice Note 12: Transboundary Impacts* (Ref 5-5) and specifically Annexes A and B, which set out the criteria and relevant considerations taken into account by the Planning Inspectorate when screening Nationally Significant Infrastructure Projects (NSIP) for likely significant effects on the environment in another European Economic Area (EEA) state.

5.11.2 The nearest EEA states are the Republic of Ireland at over 385km west and the Netherlands at over 330km east of the Project Site. Taking into account the potential pollution impact pathways through air, land and water, and the effects predicted to arise from the Project, set out in **Chapter 6: Air Quality**, **Chapter 8: Nature Conservation (Terrestrial Ecology)**, **Chapter 17: Marine Water and Sediment Quality** and **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage** within their respective spatial scopes, the likelihood of significant effects on the environment of another EEA state is considered negligible. Therefore, significant transboundary effects associated with the Project are not anticipated or assessed and have been scoped out.

5.12 Consultation and Engagement

5.12.1 The Project has a wide range of stakeholders with differing interests that will require varied levels of consultation. Specific communication activities therefore need to be undertaken to meet the needs of specific individuals and groups. This requires an understanding of the stakeholders and their interests in the Project.

Pre-application Consultation

5.1.3 Sections 42 and 47 of the PA2008 (Ref 5-11) requires the Applicant to undertake pre-application consultation with a range of prescribed consultees. The key stakeholders to be consulted as part of the pre-application process include:

a. Prescribed statutory bodies.

b. Local authorities.

c. Landowners/those with interests in the land.

d. Local communities.

e. Other key interest groups.

5.12.2 In addition to statutory consultation with prescribed consultees, as best practice, applicants are also encouraged to engage in non-statutory consultation with all potentially affected parties to enable them to gain a better understanding of the Project. Local knowledge and understanding is important, and the Applicant is

engaging with consultees through both formal consultation and informal engagement prior to submission of the DCO Application.

5.12.3 Consultation and engagement with stakeholders helps to inform the preparation of key materials as part of the EIA in support of the pre-application DCO process.

5.12.4 A Consultation Report will form part of the DCO Application and will summarise how pre-application consultation was undertaken and set out how feedback received, including the feedback on the content of this PEI Report, was taken into account by the Applicant.

Technical Engagement

5.12.5 In addition to the stages of pre-application consultation, the Applicant will hold informal engagement with the key prescribed consultees, as appropriate, to refine the Project and the EIA and to assist in the development of any required mitigation or other environmental measures. Specific information on this is presented in the environmental topic chapters (**Chapters 6 to 24**).

5.12.6 A summary of technical stakeholder engagement is summarised within the individual technical chapters within this PEI Report. In addition, the Applicant will seek to agree draft Statements of Common Ground with key stakeholders to set out matters that have been agreed prior to submission of the DCO Application.

5.13 Assumptions and Limitations

5.13.1 Each technical chapter of the PEI Report sets out any assumptions made and limitations encountered whilst undertaking and reporting the respective assessments.

5.14 Other Assessment Requirements

5.14.1 At this stage in the process, the need to undertake a range of other assessments to inform the EIA, and/or other consent requirements has been identified. The following assessments will be undertaken and reported at the ES stage.

Habitat Regulations Assessment

5.14.2 In accordance with Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive') (Ref 5-12) and Directive 2009/147/ES of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (the 'Birds Directive') (Ref 5-13), a network of protected sites has been designated by EU member states for the protection of Europe's most valuable and threatened habitats and species. These areas are known as European sites. The Conservation of Habitats and Species Regulations 2017 (SI 2017 No. 1012) (the 'Habitats Regulations') transpose the EU Directives into UK law (Ref 5-14) and remain in place following the UK's exit from the EU.

5.14.3 When assessing the DCO Application, the SoS (as a competent authority under the Habitats Regulations) must consider the potential for a likely significant effect (LSE) on a European site. European sites are defined as Special Area of Conservation (SAC), candidate SACs, Sites of Community Importance (SCI) and

Special Protection Areas (SPA). UK policy extends the requirements pertaining to European sites to include Ramsar sites and potential SACs and SPAs, which include proposed extensions or alterations to existing SPAs.

5.14.4 If it is concluded that the Project has the potential for a Likely Significant Effect (LSE) on a European site, an Appropriate Assessment (AA) of the implications of the proposals in light of the site's conservation objectives will be required. An AA will take account of the LSE of the Project on the protected areas, either alone or in combination with other plans and projects. The screening, any AA and any subsequent assessment form part of what is known as the Habitats Regulations Assessment (HRA) process.

5.14.5 To facilitate the HRA process, the Applicant will provide information within the DCO Application to enable an AA to be undertaken and will liaise with Natural England and other relevant parties on its preparation, as required.

5.14.6 A Screening Report for the HRA for the Project is appended to **Chapter 9: Nature Conservation (Marine Ecology)** (**Appendix 9.C** PEI Report, Volume IV).

Flood Risk Assessment

5.14.7 A Flood Risk Assessment (FRA) will be submitted with the DCO Application. The FRA will assess the flood risk both to and from the Project and demonstrate how that flood risk will be managed over the Project's lifetime. The FRA will give due regard to climate change and will form an appendix to the ES.

Marine Plan and Policy Conformance Assessment

5.14.8 As the Project falls within the area covered by the East Inshore Marine Plan (Ref 5-15) a marine plan and policy conformance assessment will be required to support the application for a deemed marine licence for the Project.

5.14.9 This assessment will be undertaken to review the Project against the vision, objectives and policies of the East Inshore Marine Plan and will be informed by the information provided in the ES.

Navigational Risk Assessment

5.14.10 Given the nature of the Project, a Navigational Risk Assessment (NRA) will be undertaken to meet the requirements of the Port Marine Safety Code (PMSC) and will be provided within the DCO Application.

5.14.11 In reviewing the application, navigational risk will be a consideration by the Harbour Authority in its role as Statutory Harbour Authority (SHA). As part of the NRA process, a hazard identification workshop will be held with relevant navigational stakeholders for the area to identify the potential impacts associated with the Project.

5.14.12 The NRA will determine the likely risk to navigational safety and, if necessary, establish risk control measures to reduce that risk to be 'as low as reasonably practicable'.

5.14.13 The outputs from the NRA will inform **Chapter 12: Marine Transport and Navigation** of the ES and the NRA will form an appendix to the ES. The PEI Report in respect of this topic is provided in **Chapter 12: Marine Transport and Navigation**.

Water Framework Directive Assessment

5.14.14 A Water Framework Directive (WFD) assessment (Ref 5-16) will be undertaken and will consider activities in the marine environment up to one nautical mile out to sea.

5.14.15 A WFD assessment will form an appendix to the ES. The assessment will involve up to three stages:

a. Screening – excludes any activities that do not need to go through the scoping or impact assessment stages.

b. Scoping – identifies the receptors that are potentially at risk from an activity and the need for impact assessment.

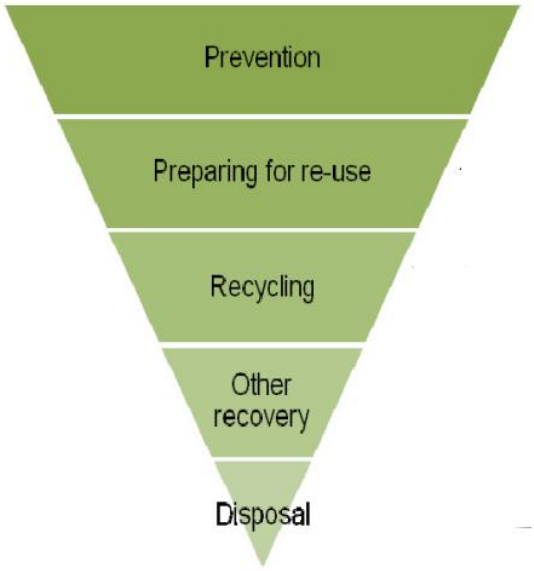
c. Impact assessment – considers the potential impacts of activities, identifies ways to avoid or minimise impacts, and shows if activities may cause deterioration or jeopardise the water body achieving good status.

Waste Hierarchy Assessment

5.14.16 Defra outline in the *Guidance on Applying the Waste Hierarchy* (Ref 5-17) document that “the waste hierarchy” ranks waste management options according to what is best for the environment. It gives top priority to preventing waste in the first place. When waste is created, it gives priority to preparing it for re-use, then recycling, then recovery, and last of all disposal (e.g. landfill).”

5.14.17 The Project will undergo a Waste Hierarchy Assessment (WHA) to determine the Best Practical Environmental Option (BPEO) for dealing with dredge arisings. This assessment will involve an evaluation of the dredge and disposal methods likely to be involved and will follow the waste hierarchy outlined in **Plate 5-1**.

Plate 5-1 Waste Hierarchy Waste Management Options



5.14.18 The impacts of any waste generated by the landside facilities will also be evaluated as part of the ES.

5.15 References

Ref 5-1 The Planning Inspectorate (2017). *Advice Note Three: EIA Consultation and Notification* (Version 7).

Ref 5-2 The Planning Inspectorate (2020). *Advice Note Seven: Environmental Impact Assessment, Preliminary Environmental Information, Screening and Scoping* (Version 7).

Ref 5-3 The Planning Inspectorate (2018). *Advice Note Nine: Rochdale Envelope* (Version 3).

Ref 5-4 The Planning Inspectorate (2022). *Advice Note Ten: Habitats Regulations Assessment relevant to Nationally Significant Infrastructure Projects* (Version 9).

Ref 5-5 The Planning Inspectorate (2020). *Advice Note Twelve: Transboundary Impacts and Process* (Version 6).

Ref 5-6 The Planning Inspectorate (2019*). Advice Note Seventeen: Cumulative Effects Assessment* (Version 2).

Ref 5-7 The Planning Inspectorate (2017). *Advice Note Eighteen: The Water Framework Directive* (Version 1).

Ref 5-8 UK Government (2017). *The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017*.

Ref 5-9 IEMA (2017). *Delivering Proportionate EIA.*

Ref 5-10 R.V. Rochdale MBC ex parte Milne (No. 1); and R. V. Rochdale MBC ex parte Tew [1999] and R. v. Rochdale MBC ex parte Milne (No. 2) [2000].

Ref 5-11 UK Government (2008). Planning Act 2008.

Ref 5-12 The European Community (1992). Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive')

Ref 5-13 European Parliament (2009). Directive 2009/147/EC of the European Parliament and of the Council.

Ref 5-14 UK Government (2017). The Conservation of Habitats and Species Regulations 2017.

Ref 5-15 Maritime Management Organisation (2016). East Inshore and East Offshore Marine Plans.

Ref 5-16 Environment Agency (2017) Water Framework Directive assessment: estuarine and coastal waters.

Ref 5-17 Department for Environment, Food and Rural Affairs (Defra) (2011). Guidance on applying the Waste Hierarchy.

5.16 Abbreviations and Glossary of Terms

Table 5.5 Abbreviations and Glossary of Terms

Term	Acronym	Meaning
Appropriate Assessment	AA	The assessment of the impact on the integrity of a European site of a project or plan, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives.
Baseline environment	-	The environment as it appears (or would appear) immediately prior to the implementation of the project together with any known or foreseeable future changes that would take place before completion of the project.
Best Practical Environmental Option	BPEO	The Best Practical Environmental Option is the idea that there is a unique, supremely beneficial method of disposing wastes in a cost-effective manner, in both the short and long term.
Combined effect	-	A type of cumulative effect which occurs when different types of activity combine to have an effect on a specific receptor or resource.
Construction Environmental Management Plan	CEMP	A Construction Environmental Management Plan describes the specific mitigation measures to be followed by the appointed construction contractor to reduce potential nuisance impacts.
Cumulative effect (or impact)	-	A cumulative impact (or effect) may arise as the result of: The combined impact of a number of different environmental topic-specific impacts from a single environmental impact assessment project on a single receptor/ resource. The combined impact of a number of different projects within the vicinity (in combination with the environmental impact assessment project) on a single receptor/ resource.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Department for Environment, Foods and Rural Affairs	Defra	The Government department responsible for policy and regulations on environmental, food and rural issues.

Term	Acronym	Meaning
European Economic Area	EEA	Free-trade zone created in 1994, composed of the states of the European Union together with Iceland, Norway, and Liechtenstein.
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
Flood Risk Assessment	FRA	The process of assessing potential flood risk to a site and identifying whether there are any flooding or surface water management issues that may warrant further consideration or may affect the feasibility of a project.
Future baseline	-	The likely evolution of the current state of the environment without implementation of the project.
Habitats Regulations Assessment	HRA	An assessment of projects (or plans) potentially affecting European Sites in the UK, required under the Habitats Directive and Regulations. Also known as an assessment of implications on European Sites.
Institute of Environmental Management and Assessment	IEMA	A professional body for practitioners working in the fields of environmental management and assessment.
Immingham Green Energy Terminal	IGET	A multi-user liquid bulk jetty, located on the eastern side of the Port of Immingham,
Kilometre	km	A unit of measurement.
Likely Significant Effect	LSE	Schedule 4 of the Regulations requires an environmental statement to include a description of the likely significant effects of the development on the environment.
Nationally Significant Infrastructure Project	NSIP	A type of project listed in the Planning Act 2008, which must be consented by a Development Consent Order.
Navigational Risk Assessment	NRA	A Navigational Risk Assessment identifies and assesses the hazards and risks affecting vessel navigation.
Order Limits	-	The extent of the area within which the Scheme may be carried out.

Term	Acronym	Meaning
Preliminary Environmental Information	PEI	The information referred to in Part 1 of Schedule 4 of the EIA Regulations that has been reasonably compiled by the applicant and is reasonably required to assess the environmental effects of a project.
Port Marine Safety Code	PMSC	This is a safety code for harbour authorities with statutory powers and duties in the UK and sets out a national standard for port marine safety.
Register of Environmental Actions and Commitments	REAC	A register of environmental actions and commitments which is based on mitigation as defined in the Environmental Statement.
Rochdale Envelope	-	An approach to consenting and Environmental Impact Assessment, named after a UK planning law case, which allows the promoters of projects to broadly define their schemes within agreed parameters to retain flexibility of design.
Secretary of State	SoS	The head of a major government department, who is ultimately responsible for granting consent for relevant Nationally Significant Infrastructure Projects.
Spatial scope	-	The geographic area over which environmental impacts and effects could occur as a result of a project.
Special Area of Conservation	SAC	Sites designated under EU legislation for the protection of habitats and species considered to be of European interest.
Site of Community Importance	SCI	Site of Community importance means a site which, in the biogeographical region or regions to which it belongs, contributes significantly to the maintenance or restoration at a favourable conservation status of a natural habitat type in Annex I or of a species in Annex II.
Special Protection Area	SPA	Sites designated under the European Directive on the Conservation of Wild Birds for the protection of birds in member states.
Statutory Harbour Authority	SHA	A statutory body responsible for the management and running of a harbour. The powers and duties in relation to a harbour are set out in either local Acts of Parliament or a Harbour Order.
Temporal scope	-	The duration of time over which environmental impacts and effects could occur as a result of a project.

Term	Acronym	Meaning
Transboundary effects	-	The term used to describe the significant environmental effects of a project which extend beyond the boundary of the European Economic Area State within which it would be implemented.
Waste Framework Directive	Waste FD	The Waste Framework Directive sets the basic concepts and definitions related to waste management, including definitions of waste, recycling and recovery
Waste Hierarchy Assessment	WHA	If required, this assessment will involve an evaluation of the dredge and disposal methods likely to be involved and will follow the waste hierarchy of Prevention, Preparing for re-use, Recycling, Other Recovery or Disposal.
Waste and Resources Action Programme	WRAP	The Waste Resources Action Programme is a British registered charity working with businesses, individuals and communities to achieve a circular economy.
Water Framework Directive Assessment	WFD	Assessment to identify how the project has the potential to affect each of the water body's quality/ quantity elements and whether it could lead to non-compliance with the Water Framework Directive.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 6: Air Quality

Associated British Ports

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Table of contents

Chapter Pages

Tables

6 Air Quality

6.1 Introduction

6.1.1 This chapter presents the preliminary findings of the assessment of the likely effects of the Project on local air quality.

6.1.2 There may be interrelationships related to the potential effects on Air Quality (AQ) and other disciplines. Therefore, also refer to the following chapters:

a. **Chapter 08: Terrestrial Ecology.**

b. **Chapter 09: Marine Ecology.**

c. **Chapter 12: Marine Transport and Navigation.**

d. **Chapter 13: Traffic and Transport**.

e. **Chapter 24: Human Health and Wellbeing.**

6.1.3 This chapter is also supported by the following figures and appendices:

a. **Figure 6.1: Air Quality Study Area** – showing the location of air quality sensitive receptors, air quality monitoring locations in relation to the proposed red line boundary of the Project (PEI Report, Volume III).

b. **Figure 6.2: Construction Phase Assessment** – showing construction dust receptors and the areas within which unmitigated impacts may occur (PEI Report, Volume III).

c. **Figure 6.3 (a-d): Operational Phase Impacts** – showing operational phase receptors and the magnitude of operational impacts (PEI Report, Volume III).

d. **Appendix 6.A: Construction Phase Assessment Method** – detailing the approach to the construction phase assessment (PEI Report, Volume IV).

e. **Appendix 6.B: Operational Phase Assessment Method** – detailing the approach to the operational phase assessment (PEI Report, Volume IV).

6.1.4 The local air quality assessment is supported by other topic chapters of the PEI Report, including traffic data generated for the assessment reported in **Chapter 13: Traffic and Transport**. Air quality impacts also have the potential to effect nature conservation sites. The significance of any effect on such sites and protected features is described in this air quality chapter, with inputs provided by a competent expert in **Chapter 8: Terrestrial Ecology** and **Chapter 9: Marine Ecology**.

6.2 Approach to Assessment

Scoping Summary

6.2.1 A scoping exercise was undertaken in August 2022 to establish the form and nature of the air quality assessment, and the approach and methods to be followed.

6.2.2 The Scoping Report (**Appendix 1.A** of the PEI Report, Volume IV) records the findings of the scoping exercise and details the technical guidance, standards,

best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on air quality.

6.2.3 Following receipt of the Scoping Opinion (**Appendix 1.B** of the PEI Report, Volume IV) as to the information to be provided in the Environmental Statement, the requirements set out in **Table 6.1** have been agreed with the Planning Inspectorate as those to be taken into account as part of the ongoing air quality assessment:

Table 6.1 Scoping Opinion Comments on Air Quality

Consultee	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	The Air Quality Chapter refers to modelling of multiple emission release heights from stacks and/ or vents to encourage optimal dispersion of emissions, as well as use of Selective Catalytic Reduction. The project description of the ES needs to describe the energy plant in detail. The maximum height of any stack(s) must be provided and any assumptions regarding minimum stack heights should also be set out.	The Project Description is described in **Chapter 2 The Project**. Dispersion model input parameters, including modelled stack height, are provided in **Appendix 6.B** (PEI Report Volume IV).
	The study area is based on screening criteria for assessments of dust and road traffic emissions. The Scoping Report does not discuss how the study area would be established for the assessment of emissions to air from vessel movements and energy plant process contributions. The ES should describe the study area for the assessment, and this should be established in line with relevant guidance and in consultation with relevant consultation bodies. The study areas should be based on the zone of influence (ZOI) for all sources associated with the Proposed Development including on site plant/machinery and vessel movements serving the site. Figure(s) should be used to illustrate the extent of the study area.	The study area for energy plant is described in **Section 6.5** and is based on Environment Agency guidance. There is no standard guidance that defines a suitable study area for the consideration of vessel emissions. Instead, the AQ assessment will report impacts that include docked vessel emissions at the worst affected air quality sensitive receptors located in each direction from that and all other sources modelled. The study areas used to define the assessment of emissions are described in **Section 6.5**. The extent of the study area is displayed in **Figure 6.1** (PEI Report, Volume III) which shows the spatial extent of air quality sensitive receptors considered in the assessment.
	The Scoping Report proposes to rely on existing air quality survey data. The Inspectorate supports the use of existing data in principle; however the Applicant should ensure that the data is up to date and geographically accurate and is advised to seek agreement with North East Lincolnshire Council (NELC) on the survey requirements.	The assessment reported in the PEI Report is informed by existing data made available by the Local Authority, data published by Defra, and project specific nitrogen dioxide data gathered in the local area. No direct AQ-specific consultation has been held with the Local Authority to date, although all air quality data

Consultee	Summary of Response	How comments have been addressed in this chapter
		gathered by the Local Authority is publicly available from their Annual Status Reports, which are published online. Monitoring data collected in the last calendar year is presented in **Section 6.4.**
	The Scoping Report does not specify which pollutants would be included in the assessments and provides baseline information on NO_2 and PM_{10} only. The Applicant is advised to seek agreement with NELC on the range of pollutants to be included in the assessments, this should include consideration of $PM_{2.5}$, NO_X, NH_3 and SO_2 where relevant.	No direct AQ-specific consultation has been held with the Local Authority to date. But consultation will be had with the Local Authority prior to submission of the ES. Pollutants of concern considered in the air quality assessment for the PEIR do extend beyond nitrogen dioxide (NO_2) and particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}), and also include oxides of nitrogen (NO_X), ammonia (NH_3), sulphur dioxide (SO_2), carbon monoxide (CO) and nitrogen deposition. The range of pollutants modelled are set out in **Table 6.5**.
	The Scoping Report seeks to scope out impacts arising from decommissioning of landside infrastructure on the grounds that the impacts would be uncertain, working practices unknown, and impacts are likely to be no worse than those arising from the construction and operation phases. Paragraphs 2.4.48 – 2.4.49 commit to producing an Outline Decommissioning Strategy with the application to be secured within the DCO. Subject to the provision of this Outline Decommissioning Plan, the Inspectorate agrees to scope out this matter from the ES.	This is noted.
	Paragraph 5.6.8 suggests that the operational phase assessment would consider emissions from vessel energy plant when vessels are docked at the facility, and not include an assessment of emissions from vessels in transit. The Scoping Report does not provide an estimate of operational vessel movements therefore the Inspectorate is not in a position to scope out an assessment of operational vessel movements. The	There is limited guidance available on the screening of marine vessel emissions for the purpose of air quality assessments. Defra guidance (LAQM TG22 (Ref 6-7)) provides screening criteria for use by Local Authorities in their Local Air Quality Management responsibilities. The Project will not meet the screening criteria set by Defra guidance for LAQM matters, based on the number

Consultee	Summary of Response	How comments have been addressed in this chapter
	Inspectorate considers that the air quality assessment should include the emissions to air from operational vessel movements where significant effects are likely to occur and that such consideration should be based on the application of relevant threshold criteria.	of vessel movements per year and the proximity of sensitive receptors (see **Section 6.3**, **Paragraph 6.3.24**). This does suggest that vessel emissions based on the scale of the Project operations and proximity of receptors is unlikely to be an issue in isolation. To account for the impact of vessels in combination with other onsite sources, the AQ assessment reported in the PEI Report does account for vessel emissions when vessels are docked. The reason being that when docked, emissions are static and assumed to be in operation 8760 hours per year, therefore having the potential to impact on the same location for a prolonged period of time. The AQ assessment does not account for vessel emissions when they are in motion. Such emissions are transient and intermittent - only affecting individual habitat for the limited period of time in which a vessel maneuvers past a sensitive location and only when the wind is blowing from the vessel towards it. Based on the speed of vessels (20 knots (23 mph)) and the frequency of IGET vessel movements (4 movements every 3 days, or 1.3 movements per day), impacts at any one location are likely to occur for less than 1 hour per day (4% of the year). Such an impact is considered unlikely to contribute to a significant effect. The methodology for vessel emissions is discussed in **Paragraphs 6.3.20 to 6.3.37** and **Appendix 6.A** (PEI Report, Volume IV).
	The effect of odour during operation has not been scoped into the assessment or reasons provided why this has been scoped out. This matter should be considered as part of the assessment made for air quality effects, as well as part of the health and well-being assessment, should significant effects be likely to occur.	A qualitative assessment of odour emissions in the PEI Report chapter with reference to Institute of Air Quality Management Odour guidance. The methodology is set out in **Paragraphs 6.3.16 to 6.3.19.** **Chapter 24: Human Health and Wellbeing** will consider the potential health impacts arising from odour.

Consultee	Summary of Response	How comments have been addressed in this chapter
Natural England	We note and welcome the report's reference to the assessment of air quality issues arising from traffic generation during the construction and operational lifetime of the scheme (para 5.2.1) and offer the following comments: Air quality in the UK has improved over recent decades but air pollution remains a significant issue. For example, approximately 85% of protected nature conservation sites are currently in exceedance of nitrogen levels where harm is expected (critical load) and approximately 87% of sites exceed the level of ammonia where harm is expected for lower plants (critical level of 1µg) [1].A priority action in the England Biodiversity Strategy is to reduce air pollution impacts on biodiversity. The Government's Clean Air Strategy also has a number of targets to reduce emissions including to reduce damaging deposition of reactive forms of nitrogen by 17% over England's protected priority sensitive habitats by 2030, to reduce emissions of ammonia against the 2005 baseline by 16% by 2030 and to reduce emissions of NOx and SO2against a 2005 baseline of 73% and 88% respectively by 2030. Shared Nitrogen Action Plans (SNAPs) have also been identified as a tool to reduce environmental damage from air pollution. The planning system plays a key role in determining the location of developments which may give rise to pollution, either directly, or from traffic generation, and hence planning decisions can have a significant impact on the quality of air, water and land. The ES should take account of the risks of air pollution and how these can be managed or reduced. This should include taking account of any strategic solutions or SNAPs, which may be being developed or implemented to mitigate the impacts of air quality. Further information on air pollution impacts and the sensitivity of different habitats/designated sites can be	The construction and operation of the Project is not anticipated to generate 500 or more two-way Light Duty Vehicle (LDV) movements nor 100 or more two-way LDV movements on the local road network. The number of additional vehicle movements falls well below the screening criteria set by IAQM/EPUK and National Highways guidance to suggest when road traffic emissions have the potential to contribute to a significant effect on air quality at sensitive locations (see **Section 6.8**, **Paragraph 6.8.33** for construction phase and **Section 6.8**, **Paragraph 6.8.43** for operational phase). As such, the air quality assessment reported in the PEI Report does not quantify emissions associated with construction phase or operational road traffic movements. The AQ assessment does quantify the impact of onsite emissions, including those from docked vessels, on air quality sensitive habitats, including nearby saltmarsh habitat within the Special Area of Conservation (SAC). The assessment method is described in **Paragraphs 6.3.20 to 6.3.37** and **Appendix 6.B** (PEI Report, Volume IV). Assessment results are described in **Paragraphs 6.8.39 to 6.8.45.**

Consultee	Summary of Response	How comments have been addressed in this chapter
	found on the Air Pollution Information System (www.apis.ac.uk). Natural England has produced guidance for public bodies to help assess the impacts of road traffic emissions to air quality capable of affecting European Sites. Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations -NEA001	
	With regard to the construction phase the focus on PM_{10}, set out in this para (5.6.2) should be reviewed with regard to its suitability for ecological receptors including designated sites in the context of the APIS information (site relevant critical loads).NO2 and PM2.5 should also be included in this assessment.	The construction phase assessment reported in the PEI Report has been undertaken in line with relevant IAQM guidance and includes consideration of relevant impacts at sensitive habitats. The method of the construction phase assessment is set out in **Paragraphs 6.3.1 to 6.3.7** and **Appendix 6.A** (PEI Report, Volume IV).
	We note the applicants intention to consult Natural England, Should the applicant wish to explore options for avoiding or mitigating effects on the natural environment with Natural England, we recommend that they use our Discretionary Advice Service.	This is noted.
Environment Agency	The Environment Agency will only undertake a detailed review of any air quality assessment when determining an application for an Environmental Permit. We are aware that there are receptors in the area, which are sensitive to dust (e.g. storage of new cars) and it may be prudent for the developer to be aware of this and engage with relevant local stakeholders. Paragraph 5.6.13 does not make explicit reference to Air emissions risk assessment for your environmental permit - **https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit**, however, it is referred to in paragraph 5.6.8. This guidance (although	The AQ assessment reported in the PEI Report does include consideration of potential dust impacts on dust sensitive receptors. The dust assessment method is described in **Paragraphs 6.3.1 to 6.3.7** and **Appendix 6.A** (PEI Report, Volume IV). The AQ assessment will also reference the Environment Agency guidance to inform the method of assessment for point source emissions. This guidance is referenced in **Appendix 6.B** (PEI Report, Volume IV).

Consultee	Summary of Response	How comments have been addressed in this chapter
	written for environmental permitting) will also be useful for the assessment.	
East Lindsey District Council	“I can advise that this authority has no comments to make.”	This is noted.
North East Lincolnshire Council	AQ Officer has read and reviewed the proposed EIA Scoping report, they are happy with the suggested approach and methodology used to assess the potential air quality impacts and effects of the Project on human receptors.	This is noted.

6.2.4 Having regard to the information presented within the Scoping Report (**Appendix 1.A** of the PEI Report, Volume IV), the Planning Inspectorate's Scoping Opinion (**Appendix 1.B** of the PEI Report, Volume IV) has also confirmed the Applicant's view that significant effects on air quality effects during the decommissioning phase are unlikely. Accordingly, this matter will remain scoped out of consideration in the Environmental Statement (ES).

6.3 Assessment Method

Construction Phase

Construction Dust Emissions

6.3.1 According to the Institute of Air Quality Management (IAQM), the main air quality impacts that may arise during demolition and construction activities are:

a. Dust deposition, resulting in the soiling of surfaces;

b. Visible dust plumes, which are evidence of dust emissions;

c. Elevated PM_{10} concentrations resultant of dust generating activities on site; and

d. An increase in concentration of airborne particles and NO_2 due to exhaust emissions from diesel powered vehicles and equipment on site and vehicles accessing the site.

6.3.2 Activities on construction sites are classified into four types to reflect their different potential impacts:

a. Demolition;

b. Earthworks;

c. Construction (erection of buildings and structures); and

d. Track-out (the deposition of material onto the public road network by construction vehicles leaving site).

6.3.3 The following steps, as defined by the IAQM, were followed as part of the construction dust assessment:

a. Step 1: Screen the need for a detailed assessment. Human and ecological receptors were identified and distance to the Project and construction routes were determined;

b. Step 2: Assess the risk of dust impacts arising. The potential risk of dust impacts occurring for each activity was determined, based on the magnitude of the potential dust emissions and the sensitivity of the area;

c. Step 3: Identify the need for site-specific mitigation. Based on the risk of impacts occurring, site specific mitigation measures were determined; and

d. Step 4: Define impacts and their significance. The significance of the potential residual dust impacts (taking mitigation into account) for each activity was determined.

6.3.4 The IAQM construction dust methodology used to inform this assessment is provided in more detail in **Appendix 6.A** (PEI Report, Volume IV).

6.3.5 For amenity effects from coarser dust (>PM_{10}), the aim of the IAQM guidance method is to bring forward a scheme, including mitigation measures where necessary, that would control impacts so that they give rise to negligible or minor effects (at worst) at the closest sensitive receptors. Measures that reduce dust emissions will also reduce emissions of finer particles (PM_{10}). Determination of whether an effect is likely to be significant or not is based on professional judgement (based on experience of similar projects), taking account of whether effects are permanent or temporary, direct or indirect, constant or intermittent and whether any secondary effects are caused (in this instance, secondary effects refer to dust that is generated and deposited (primary impact) and then re-suspended and deposited again by further activity).

6.3.6 The classification of dust soiling (amenity) and health effects on receptors exposed to impacts has been assessed using the relationship between the magnitude of impact identified, in combination with receptor sensitivity and other related factors where appropriate (as described in the IAQM guidance (Ref 6-19)), which results in a classification of effects as defined in **Table 6.2**.

6.3.7 The impacts associated with the construction phase of the Project have been qualitatively assessed following the approach set out in the IAQM guidance on the Assessment of Dust from Demolition and Construction (Ref 6-19).

Table 6.2 Definition of Significance for Fugitive Dust and PM_{10} Effects

Effect	Change in Dust Deposition Rate and Short-term PM_{10} Concentrations	Significance
Major	Impact is likely to be intolerable for any more than a very brief period of time and is very likely to cause complaints from local people. Increase in PM_{10} concentrations at a location where concentrations are already elevated and to the extent that the short term PM_{10} air quality objective is likely to be exceeded. Deposition impact likely to harm habitat within a designated nature conservation area of international importance.	A significant effect that is likely to be a material consideration in its own right.
Moderate	Impact is likely to cause annoyance and might cause complaints, but may be tolerated if short-term and prior warning and explanation has been given. Increase in PM_{10} concentrations at a location where concentrations are already elevated and to the extent that the short term PM_{10} air quality objective is at risk of being exceeded.	A significant effect that may be a material consideration in combination with other significant effects but is unlikely to be a material consideration in its own right.

Effect	Change in Dust Deposition Rate and Short-term PM_{10} Concentrations	Significance
	Deposition impact likely to harm habitat within a designated nature conservation area of national importance.	
Minor	Impact may be perceptible, but of a magnitude or frequency that is unlikely to cause annoyance to a reasonable person or to cause complaints. Limited increase in PM_{10} concentrations. Deposition impact likely to harm habitat within a designated nature conservation area of local importance.	An effect that is not significant but that may be of local concern.
Negligible	Impact is unlikely to be noticed by and/or have an effect on sensitive receptors. Negligible increase in PM_{10} concentrations and deposition.	An effect that is not significant.

Construction Site Plant and Non-Road Mobile Machinery Emissions

6.3.8 Emissions from construction-related Non-Road Mobile Machinery (NRMM) and site plant will have the potential to increase NO_2, PM_{10} and $PM_{2.5}$ concentrations at locations close to working areas of the site.

6.3.9 IAQM guidance (Ref 6-19) states that:

> *"Experience of assessing the exhaust emissions from on-site plant (also known as non-road mobile machinery or NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed."*

6.3.10 The assessment of potential emissions from NRMM and site plant is, therefore, qualitative in nature and focuses on the justification as to why impacts from this source can be mitigated to ensure any effect is not significant.

Construction Vessel Emissions

6.3.11 Construction phase vessel emissions have been considered in a qualitative manner in this assessment. The risk of this source contributing to a significant effect is determined by review of construction phase vessel emissions, their duration and frequency, and the proximity of those emissions to the nearest air quality sensitive receptors.

Construction Road Traffic Emissions

6.3.12 A screening assessment of construction phase road traffic emissions has been undertaken at the PEI Report stage. Preliminary traffic data has been provided that incudes daily average two-way Light Duty Vehicle (LDV) (vehicles <3.5 tonnes) movements and Heavy Duty Vehicle (HDV) (vehicles >3.5 tonnes) movements on the local road network and the nearest sections of the Strategic Road Network (SRN).

6.3.13 Daily average flows on the local road network have been screened against criteria published in IAQM and Environmental Protection (EPUK) guidance (Ref 6-25). The guidance suggests that a detailed assessment of local air quality is likely to be required where:

a. A road link not situated within or adjacent to an Air Quality Management Area (AQMA) experiences a:
   i. change in annual average daily two-way LDV flow of 500 or more; and/or
   ii. change in annual average daily two-way HDV flow of 100 or more.
b. A road link that is situated within or adjacent to an AQMA that experiences a:
   i. change in annual average daily two-way LDV flow of 100 or more; and/or
   ii. change in annual average daily two-way HDV flow of 25 or more.

6.3.14 Daily average flows on the SRN have been screened against criteria published in National Highways guidance (Ref 6-18). The guidance suggests that a detailed assessment of local air quality is required where:

a. Annual average daily traffic (AADT) flow changes by 1000 or more two-way movements; or
b. HDV AADT changes by 200 or more two-way movements.

Operational Phase

Operational Road Traffic Emissions

6.3.15 A screening assessment of operational road traffic emissions has also been undertaken at the PEI Report stage. Preliminary data has been provided that includes staff numbers and daily monthly truck visits. This has been used to estimate likely LDV and HDV movements on the local road network and SRN. Those anticipated movements have then been compared to the screening criteria provided in the IAQM/EPUK guidance and National Highways guidance (Ref 6-18).

Operational Odour emissions

6.3.16 A qualitative odour assessment has been undertaken with reference to IAQM odour guidance (Ref 6-3). The Project is not expected to be a significant source of odour emissions, due to the closed nature of the process system. However, with all such systems, there is the risk of fugitive emissions from potential leaks and/or accidents.

6.3.17 Odours are highly subjective. The perception of odours, whether they are pleasant or offensive, and to what extent is partly determined through the life experiences of the individual. It is, however, generally accepted that the odour associated with NH_3 is offensive.

6.3.18 Before an adverse effect (such as harm to amenity) can occur, there must be odour exposure. For odour exposure to occur all three links in the source-pathway-receptor chain must be present:

a. An emission source - a means for the odour to get into the atmosphere.

b. A pathway - for the odour to travel through the air to locations offsite, noting that:

   i. Anything that increases dilution and dispersion of an odorous pollutant plume as it travels from source to receptor will reduce the concentration at the receptor, and hence reduce exposure.

   ii. Increasing the length of the pathway (e.g. by releasing the emissions from a high stack or moving odour sources as far away from receptors as possible) will, all other things being equal, increase the dilution and dispersion.

c. The presence of receptors (such as residential properties or places where people would expect a certain level of amenity) that could experience an adverse effect, noting that people vary in their sensitivities to odour, determined by the level of amenity associated with the land use and the typical duration of exposure.

6.3.19 The effect of odour has been assessed with reference to the IAQM odour guidance (Ref 6-3). The IAQM guidance includes a description of methods by which odour effects can be determined at the pre-planning stage. It states that in order to determine the impact of odour emissions, the following elements need to be determined:

a. Description of baseline odour conditions.

b. Description of the location of receptors and their relative sensitivities to odour effects.

c. Details of potential odour sources.

d. Description of control/mitigation measures incorporated into the scheme.

e. Prediction of the likely odour effects at relevant sensitive receptors, taking into account:

   i. The likely magnitude of odour emissions;

   ii. The likely meteorological characteristics at the site;

   iii. The dispersion and dilution afforded by the pathway to receptors and the resulting magnitude of odour that could result;

   iv. The sensitivity of the receptors; and

   v. The potential cumulative odour effects.

f. Appropriate additional mitigation recommended where necessary; and

g. Residual odour effects and the determination of impact significance.

Operational Site and Vessel Emissions

6.3.20 Site emissions consist of a number of onshore hydrogen production units and flares, and offshore vessel combustion plant emissions.

6.3.21 The onshore hydrogen production units will be fuelled initially by natural gas. The main pollutant of concern from this will therefore be NO_X, although some NH_3 may be present in emissions also, particularly if Selective Catalytic Reduction (SCR) is applied to control the NOx emissions. NO_X and NH_3 at elevated concentrations are harmful to nature conservations sites and, when NO_X is converted to NO_2, it is also harmful to human health. NO_2 and NH_3 also contribute to nitrogen deposition, which is another pollutant that is harmful to nature conservation sites. Flares on site will be required to operate in an emergency or during plant start-up to burn off the release of NH_3, which will therefore also be a source of NO_X emissions.

6.3.22 Exhaust emissions from berthed vessels during operation have the potential to impact on local air quality. At such time, the vessel emissions source is static and, given the anticipated frequency of vessels in dock, all but constant throughout the year. This means that docked vessel emissions will impact on the same locations consistently throughout the year, subject to meteorological conditions. Docked vessel emission impacts on local air quality have been quantified in this assessment.

6.3.23 Emissions from vessels in motion during operation have not been quantified in this assessment. This is because, when in motion, the vessel emissions source is transient and will not impact on the same location for more than a few minutes per vessel movement. The Project includes up to two berths, and it has been assumed that each vessel will be docked for a period of three days. Smaller vessels may be docked for shorter periods but the three day assumption produces a worst case for ship emissions when moored at the berths. It is anticipated that there will be up to 400 calls per year, which will equate to 2.2 two-way vessel movements per day. At a speed of 10 to 20 knots, vessel emissions when in movement will be intermittent to the extent that they will not contribute to a significant air quality effect.

6.3.24 It is also noted that the number of operational vessel movements fall below the Defra LAQM-TG(22) guidance criteria (Ref 6-7), which states that for the purpose of Local Air Quality Management, emissions from port expansions may need to be considered where:

a. There are more than 5,000 ship movements per year (i.e. cross-channel ferries, roll on-roll off ships, bulk cargo, container ships, cruise liners, etc – one ship generating two movements (arrival and departure)), with relevant exposure within 250 m of the berths and main areas of manoeuvring; or

b. There are more than 15,000 large ship movements per year, with relevant exposure within 1 km of these areas.

6.3.25 Pollutants of concern vary depending on the fuel type of the vessel engine, such as Liquified Natural Gas (LNG) and Marine Gas Oil (MGO) but will include NO_X (NO and NO_2). Vessels using the Project in the operational phase will need to comply with relevant International Convention for the Prevention of Pollution from Ships (MARPOL) NO_X and SO_2 emission standards (Ref 6-25). For SO_2, engines will either have to operate using MGO with a low sulphur content (0.10 and 1.50 m/m %), or with an SO_2 scrubber. Sulphur emissions are therefore likely to be negligible and are not considered further in this assessment.

6.3.26 The detailed assessment methodology followed to quantify the impact and total concentrations of the pollutants of concern is set out in **Appendix 6.B** (PEI Report, Volume IV).

6.3.27 Significance of local air quality effects is then determined in line with IAQM and EPUK guidance (Ref 6-25). This approach does not define a graduating scale of human health receptor sensitivity. Instead, human health receptors are considered either sensitive or not, depending on the period of time for which they are exposed to emissions. The absolute magnitude of change in pollutant concentrations between the baseline and assessment scenarios, relative to the air quality objective value, is described and this is used to consider the risk of those objectives being exceeded.

6.3.28 For a change in annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$, of a given magnitude, the IAQM and EPUK guidance provides recommendations for describing the effects of such impacts at individual receptors. These are set out in **Table 6.3**.

Table 6.3 Impact Descriptors at Individual Receptors - Annual Mean NO_2, PM_{10} and $PM_{2.5}$

Annual Mean Concentrations at Receptor in Assessment Year (% of air quality objective)	% Change in Concentration Relative to Air Quality Assessment Level (AQAL)				
	<1 %[1]	1 %[2]	2-5 %[3]	6-10 %[4]	> 10 %[5]
≤75 %	Negligible	Negligible	Negligible	Slight	Moderate
76 % – 94 %	Negligible	Negligible	Slight	Moderate	Moderate
95 % – 102 %	Slight	Slight	Moderate	Moderate	Substantial
103 % – 109 %	Moderate	Moderate	Moderate	Substantial	Substantial
≥110 %	Moderate	Moderate	Substantial	Substantial	Substantial

[1] Imperceptible; [2] Very low; [3] Low; [4] Medium; and [5] Large

6.3.29 The IAQM/EPUK guidance states that the descriptors are for individual receptors only and that overall significance is determined using professional judgement. It also states that it is unwise to ascribe too much accuracy to incremental changes or background concentrations, and this is especially important when total concentrations are close to the objective value. For a given year in the future, it is impossible to define the new total concentration without recognising the inherent uncertainty, which is why there is a category that has a range around the objective value, rather than being exactly equal to it.

6.3.30 A change in predicted long-term (annual mean) concentrations of less than 0.5 % of an air quality objective is considered to be ‘Imperceptible’. An impact that is

'Negligible', given normal bounds of variation, would not be capable of having a direct effect on local air quality that could be considered to be significant.

6.3.31 The guidance suggests the potential for 'Low' air quality impacts as a result of changes in pollutant concentrations between 2 % and 5 % of relevant air quality objective. For example, for annual mean NO_2 and PM_{10} concentrations, this relates to changes in concentrations ranging from 0.6 – 2.1 µg/m^3. In practice, changes in concentration at the lower end of this magnitude band are likely to be very difficult to distinguish from the inter-annual effects of varying meteorological conditions and are therefore not considered likely to be capable of having a direct effect on local air quality that could be considered to be significant.

6.3.32 Changes in concentration of more than 5% are considered to be of a magnitude which is far more likely to be discernible above the normal variation in baseline conditions and, as such, carry additional weight within the overall evaluation of significance for air quality. 'Moderate' impacts do not necessarily constitute a significant effect, where they do not contribute to an exceedance or risk of an exceedance of an air quality objective, particularly where such impacts relate to a small minority of receptors when the majority experience lesser impacts. A 'Substantial' impact will almost certainly constitute a significant effect that will require additional mitigation to address.

6.3.33 The IAQM and EPUK guidance also provides thresholds for determining whether short-term (1-hour mean and 24-hour mean) impacts on human health sensitive receptors have the potential to cause a significant effect or not. The guidance indicates that severity of peak short-term concentrations can be described without the need to reference background concentrations as the source contribution is used to measure impact, not the overall short-term concentration at the receptor. The guidance suggests the following criteria to determine the impact of peak short-term source contributions:

a. Source contributions ≤10 % of the air quality objective represents an Imperceptible impact that is 'Negligible';

b. Source contributions between 11-20 % of the air quality objective or is Small in magnitude, representing a 'Slight' impact;

c. Source contributions 21-50 % of the air quality objective is Medium in magnitude, representing a 'Moderate' impact; and

d. Source contributions ≥51 % of the air quality objective is Large in magnitude, representing a 'Substantial' impact.

6.3.34 In addition to the short-term criteria provided by the IAQM/EPUK, the magnitude of the change in the predicted number of exceedances of the short-term 24-hour PM_{10} objective can be directly derived from the predicted annual average PM_{10} value using the relationship defined in LAQM.TG (22) (Ref 6-7). An exceedance of the short-term PM_{10} air quality objective is unlikely where annual mean PM_{10} concentrations are less than 32 µg/m^3. Research projects completed on behalf of Defra and the Devolved Administrations (Ref 6-1 and Ref 6-22) have concluded that the short-term 1-hour NO_2 objective is unlikely to be exceeded where annual mean concentrations are predicted to be less than 60 µg/m^3.

6.3.35 For impacts at nature conservation receptors, whether the effect is significant or not is determined by a competent expert in ecology. To inform this judgement, the Environment Agency provide guidance (Ref 6-13) that states that impacts may be considered insignificant ('not significant') where the long-term (annual) impact is less than 1% of the long-term air quality objective or environmental assessment level for the nature conservation site.

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

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

6.4 Legislation, Policy and Guidance

6.4.1 **Table 6.4** presents the legislation, policy and guidance relevant to the air quality assessment and details how their requirements will be met in the assessment.

Table 6.4 Relevant legislation, policy and guidance regarding local air quality

Legislation / Policy / Guidance	Consideration within the PEI Report
Clean Air for Europe	
The Clean Air for Europe (CAFE) programme consolidated and replaced (with the exception of the 4th Daughter Directive) preceding directives with a single legal act, the Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC (Ref 6-4) (hereafter referred to as the 'EU Air Quality Framework Directive'). This directive is transcribed into UK legislation by the Air Quality Standards Regulations 2010 (Ref 6-14) which came into force on 11 June 2010. The 2010 Regulations were amended by the Air Quality Standards Regulations 2016 (Ref 6-15), which came into force on 31 December 2016. The limit values defined therein are legally-binding and are considered to apply everywhere (with the exception of the carriageway and central reservation of roads and any locations where the public do not have access). EU limit values were published in these regulations for 7 pollutants, as well as target values for an additional 5 pollutants.	Informed methodology described in **Section 6.2** and results in **Section 6.6**.
UK Air Quality Strategy	
Part IV of the Environment Act (2021) (Ref 6-17) requires H.M. Government to produce a national Air Quality Strategy (AQS) which contains standards, objectives and measures for improving ambient air quality. Defra's Clean Air Strategy is the current revision of the Strategy (Ref 6-6). The AQS outlines proposals to tackle emissions from a range of sources. This includes providing clear and effective guidance on how Air Quality Management Areas (AQMAs), Clean Air Zones (CAZ) and Smoke Control Areas interrelate and how they can be used by local government to tackle pollution. New legislation will seek to shift the focus towards prevention of exceedances rather than tackling pollution when limits have been surpassed. The AQS sets out air quality objectives that are maximum ambient pollutant concentrations that are not to be exceeded either without	Informed methodology described in **Section 6.2** and results in **Section 6.6**.

Legislation / Policy / Guidance	Consideration within the PEI Report
exception or with a permitted number of exceedances over a specified timescale. Air quality objectives, as defined by the Air Quality Strategy, are generally in line with the EU Limit Values, although they have different dates for compliance, and a different legal status as follows: a. EU limit values (as transcribed into UK legislation) are legally binding in the UK. National government compliance at the agglomeration scale is mandatory. b. UK air quality objectives are for the purposes of LAQM and there is no legal obligation for local authorities to achieve them. They do have a responsibility to work towards achieving them. The EU limit values and air quality objectives for the remaining pollutants are displayed in **Table 6.3**.	
National Policy Statement for Ports (NPSfP)	
Section 5.7 of the NPSfP (Ref 6-12) sets out the Government's policy for ports relating to air quality. It highlights key air quality concerns relating to ports as emissions from vehicles accessing and leaving ports, emissions from ship engines and dust emissions from potentially dust generating cargo. Paragraph 5.13.5 of the NPSfP describes what an air quality chapter of an ES should include: • *"Any significant air emissions, their mitigation and any residual effects, distinguishing between the construction and operation stages and taking account of any significant emissions from any road traffic generated by the project;* • *The predicted absolute emission levels from the proposed project, after mitigation methods have been applied; and* • *Existing air quality levels and the relative change in air quality from existing levels."* Section 5.8 of the NPSfP sets out policy for ports relating to emissions of dust and odour and the potential harm to amenity. It is acknowledged in the NPSfP that *"some impact on amenity for local communities is likely to be unavoidable. The aim should be to keep impacts to a minimum and at a level that is acceptable".* Paragraph 5.8.5 of the NPSfP describes what an air quality chapter of an Environmental Statement should include with regards to potential emissions of dust and odour: • *"the type, quantity and timing of emissions;* • *aspects of the development which may give rise to emissions;* • *premises or locations that may be affected by the emissions;* • *effects of the emission on identified premises or locations; and*	Informed methodology described in **Section 6.2** and specifically a description of emissions and how they have informed the impact assessment. Informed the impact results reported in **Section 6.8**, specifically predicted future baseline and future operational pollutant concentrations and impacts. Informed mitigation section described in **Section 6.7** and **Section 6.9**, including measures to reduce emissions during construction and operational phases.

Legislation / Policy / Guidance	Consideration within the PEI Report
• *measures to be employed in preventing or mitigating the emissions."*	
UK Marine Policy Statement (MPS)	
Section 2.6.2 of the UK MPS (Ref 6-5) sets out the Government's policy for marine environments relating to air quality. In paragraph 2.6.2.1 it is noted that *"The construction, operation and decommissioning phases of projects can involve emissions to air which could lead to adverse impacts on human health, biodiversity, or on the wider environment."*	Informed methodology described in **Section 6.2**.
Marine Plan – East Inshore	
The Marine Plan for the UK East Inshore region (Ref 6-23) includes some policies that are relevant to air quality and this assessment. They focus on potential impacts on nature conservation as follows: a. Policy BIO1 Biodiversity – *"Appropriate weight should be attached to biodiversity, reflecting the need to protect biodiversity as a whole, taking account of the best available evidence including on habitats and species that are protected or of conservation concern in the East marine plans and adjacent areas (marine, terrestrial)"*; b. Policy ECO1 Ecosystem – *"Cumulative impacts affecting the ecosystem of the East marine plans and adjacent areas (marine, terrestrial) should be addressed in decision-making and plan implementation";* c. Policy MPA1 Marine protected areas – *"Any impacts on the overall Marine Protected Area network must be taken account of in strategic level measures and assessments, with due regard given to any current agreed advice on an ecologically coherent network."*	Informed methodology described in **Section 6.2**.
National Planning Policy Framework (NPPF)	
The revised NPPF (Ref 6-24) sets out the Government's planning policies for England and how these are expected to be applied. The revised NPPF maintains the presumption in favour of sustainable development which should be delivered in accordance with three main objective areas: economic, social and environmental (Paragraph 8). The revised NPPF aims to enable local people and their local authorities to produce their own distinctive local and neighbourhood plans, which should be interpreted and applied in order to meet the needs and priorities of their communities. Air quality is considered as an important element of the natural environment. On conserving and enhancing the natural environment, Paragraph 174 states that: *"Planning policies and decisions should contribute to and enhance the natural and local environment by:* *…*	Informed methodology described in **Section 6.2** and results in **Section 6.6**.

Legislation / Policy / Guidance	Consideration within the PEI Report
e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality …" Air quality in the UK has been managed through the LAQM regime using national objectives. The effect of a proposed development on the achievement of such policies and plans may be a material consideration by planning authorities when making decisions for individual planning applications. Paragraph 186 of the NPPF states that: *"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."*	
Planning Practice Guidance (PPG)	
Sections of the PPG (Ref 6-11) were updated in November 2019. With regards to air quality, the updated guidance (paragraph 003 Reference ID: 32-003-20191101) states that: *"Whether air quality is relevant to a planning decision will depend on the proposed development and its location. Concerns could arise if the development is likely to have an adverse effect on air quality in areas where it is already known to be poor, particularly if it could affect the implementation of air quality strategies and action plans and/or breach legal obligations (including those relating to the conservation of habitats and species). Air quality may also be a material consideration if the proposed development would be particularly sensitive to poor air quality in its vicinity."* In paragraph 005 (Reference ID: 32-005-20191101) it is stated that: *"Where air quality is a relevant consideration the local planning authority may need to establish:* • *the 'baseline' local air quality, including what would happen to air quality in the absence of the development;* • *whether the proposed development could significantly change air quality during the construction and operational phases (and the consequences of this for public health and biodiversity); and* • *whether occupiers or users of the development could experience poor living conditions or health due to poor air quality."*	Informed methodology described in **Section 6.2** and results in **Section 6.6**.

Legislation / Policy / Guidance	Consideration within the PEI Report
The PPG goes on to state that considerations that may be relevant to determining a planning application include whether the development would (Paragraph: 006 Reference ID: 32-006-20191101): a. Lead to changes in vehicle-related emissions in the immediate vicinity of the proposed development or further afield; b. Introduce new point sources of air pollution; c. Expose people to harmful concentrations of air pollutants; d. Give rise to potentially unacceptable impacts during construction for nearby sensitive locations; and e. Have a potential adverse effect on biodiversity. f. The PPG also suggests that the following items could form part of an air quality assessment suitable for an EIA (Paragraph: 007 Reference ID: 32-007-20191101): g. A description of baseline conditions; h. Consideration of sensitive habitats (including designated sites of importance for biodiversity); i. The assessment methods to be adopted and any requirements for the verification of modelling air quality; j. The basis for assessing impacts and determining the significance of an impact; k. Where relevant, the cumulative or in-combination effects arising from several developments; l. Construction phase impacts; m. Acceptable mitigation measures to reduce or remove adverse effects; and n. Measures that could deliver improved air quality even when legally binding limits for concentrations of major air pollutants are not being breached.	
North East Lincolnshire Local Plan (2013 – 2032)	
The Local Plan was adopted in 2018 and sets out a strategic vision for the county (Ref 6-27). The plan is centered around set challenges for the Local Council and policy which has been implemented to solve them and support local economic sectors. A key challenge highlighted in the Local Plan (paragraph 14.151) is to *"ensure transport contributes to environmental excellence, improved air quality and reduced greenhouse gas emissions"* and aims to enhance the environment in parallel with delivering economic growth. A key weakness identified by the council with regards to the environment is pockets of poor air quality in Grimsby and Immingham. Immingham town itself serves the surrounding rural community. The main challenges in this area concern traffic movements and air quality in relation to proximity to the Port of Immingham.	Informed methodology described in **Section 6.2,** baseline in **Section 6.4** and results in **Section 6.6**.

Legislation / Policy / Guidance	Consideration within the PEI Report
A relevant strategic objective outlined in the Local Plan is SO [Strategic Objective] 2: Climate change. Whilst titled *"Climate change"*, this objective also includes managing air quality in the North East Lincolnshire Council area, decreasing the number of active AQMAs, and improving use of sustainable modes of transport. Several policies within the Local Plan are relevant to air quality in the Immingham port area: a. Policy 5: Development boundaries sets out how all proposed developments within the Council must consider noise and air quality, in line with sustainability considerations. b. Policy 31: Renewable and low carbon infrastructure was introduced to maximise renewable energy capacity and developments must consider use of renewable energy along with air quality impacts. c. Policy 36: Promoting sustainable transport aims to reduce congestion and improve environmental quality. This policy highlights priority areas, including the A180 corridor, where sustainable transport measures and highway improvements will be focused.	
North East Lincolnshire Council Transport Plan	
This Plan also highlights air quality in Transport Challenge H (section 1.3), which recognises that emissions of transport account for a large part of the council's total carbon emissions and is a source of poor air quality in Immingham and Grimsby (Ref 6-26).	Informed methodology described in **Section 6.2,** baseline in **Section 6.4** and results in **Section 6.6**.
North Lincolnshire Local Development Framework (LDF) (2006 to 2026)	
The North Lincolnshire Local Plan has been replaced by the Local Development Framework (LDF) (2006 to 2026). The LDF consists of a Core Strategy (Ref 6-29) which states that a key goal of the Framework is to reduce pollution levels and frame North Lincolnshire local environmental needs within the wider global picture. Most air quality management objectives focus on the AQMA at Scunthorpe. However, a relevant objective to the proposed development is: a. Spatial Objective 7: Efficient Use and Management of Resources. This aims to support measures to minimise pollution and improve air quality and ensure adequate infrastructure is in place to serve new developments.	Informed methodology described in **Section 6.2,** baseline in **Section 6.4** and results in **Section 6.6**.
North Lincolnshire Local Transport Plan (2011 – 2026)	
The plan details a strategic vision for transport management in the borough (Ref 6-30). Local transport goals include supporting sustainable modes of transport and reducing traffic related CO_2 and NO_2 emissions so as to protect and enhance the natural environment. In the Transport Plan, the A160 at South Killingholme was identified as an area of concern regarding levels of NO_2.	Informed methodology described in **Section 6.2,** baseline in **Section 6.4** and results in **Section 6.6**.

6.4.2 The EU limit values, UK air quality objectives and Environmental Assessment Levels for the pollutants of concern are displayed in **Table 6.5**. Limits and objectives are expressed in one of two ways: as annual mean concentrations which are not to be exceeded without exception, due to their chronic effects; or as shorter term (24 hour or one hour) mean concentrations for which only a specified number of exceedances are permitted within a specified time frame, due to their acute effects.

6.4.3 An air quality objective for NO_X of 30 µg/m^3 and SO_2 of 20 µg/m^3 are set for the protection of vegetation. In addition to these, critical loads for nitrogen deposition have also been determined which represent (according to current knowledge) the exposure below which there should be no significant harmful effects on sensitive elements of those habitats. Critical loads are set for different types of habitat based on their respective sensitivity to nutrient nitrogen and have been obtained for each designated site with the potential to be affected by the Project.

Table 6.5 Air quality objectives and EU limit values (H.M. Government (2010))

Pollutant	Averaging Period	Concentration	Maximum Permitted Exceedances	Target Date (AQO)	Target Data (EULV)
AQOs/EULVs for the Protection of Human Health					
Nitrogen Dioxide (NO_2)	Annual mean	40µg/m^3	None	31 Dec 2005	1 Jan 2010
	1 hour mean	200µg/m^3	18 times per year	31 Dec 2005	1 Jan 2010
Particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10})	Annual mean	40µg/m^3	None	31 Dec 2004	1 Jan 2005
	24 hour mean	50µg/m^3	35 times per year	31 Dec 2004	1 Jan 2005
Particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$)	Annual mean	20 µg/m^3	None	1 Jan 2020	1 Jan 2010
Sulphur Dioxide (SO_2)	24 hour mean	125 µg/m^3	3 times per year	31 Dec 2004	1 Jan 2005
	1 hour mean	350 µg/m^3	24 time per year	31 Dec 2004	1 Jan 2005

Pollutant	Averaging Period	Concentration	Maximum Permitted Exceedances	Target Date (AQO)	Target Data (EULV)
AQOs/EULVs for the Protection of Vegetation and Ecosystems					
Nitrogen oxides (NO_X)	Annual mean	30 µg/m^3	None	31 Dec 2000	19 Jul 2001
Sulphur dioxide (SO_2)	Annual mean	20 µg/m^3	None	31 Dec 2000	19 Jul 2001
Ammonia (NH_3)	Annual mean	1 – 3 µg/m$^{3(1)}$	None	N/A	N/A
Nutrient nitrogen deposition	Annual mean	Salt marsh: 20-30 kg N/ha/yr	None	N/A	N/A
		Coastal and floodplain grazing marsh: 10-15 kg N/ha/yr			
		Deciduous woodland: 10-20 kg N/ha/yr			
[1] 1 µg/m^3 where lichens or bryophytes (including mosses, liverworts and hornworts) are present, 3 µg/m^3 where they're not present					

Stakeholder Engagement

6.4.4 A range of stakeholders have been engaged as part of the scoping process to obtain their views on the Project and the scope of the Air Quality assessment, the results of which are presented within the Scoping Opinion (**Appendix 1.B** of the PEI Report, Volume IV).

Limitations and Assumptions

6.4.5 The information presented in this preliminary assessment reflects that obtained and evaluated at the time of reporting and is based on an emerging design for the Project and the maximum likely extents of land required for its construction and operation, based on the principles of the Rochdale Envelope.

6.4.6 The air quality assessment is informed by construction phase and operational traffic data from the traffic and transport assessment and therefore is subject to the relevant limitations, assumptions and uncertainties described in **Chapter 11: Traffic and Transport**.

6.4.7 The air quality assessment is informed by onsite emissions source characteristics and data provided by the Project design team, including the location, indicative height and internal diameter of stack emission points and vents, and the temperature, rate, and mass by pollutant of emissions released. Where there is uncertainty, precautionary assumptions have been made, including those

associated with emissions release heights and the frequency of operation of emergency sources (ie. flares).

6.4.8 The air quality assessment is informed by vessel emissions data. Actual vessel fleet and emissions data is currently unknown at this stage of Project design. In the absence of known fleet data, a reasonable estimate of likely vessel emissions has been considered. This estimate is based on the potential energy demand of vessels of the size anticipated to use the facility, emissions characteristics of a typical marine vessel engine capable of meeting that energy demand, and mass emissions limited by MARPOL Tier II emission limits.

6.4.9 Meteorological data used in the air quality assessment has been sourced from the nearest and most representative meteorological monitoring site, Humberside Airport, which is approximately 13 km southwest of the Site. This data is considered the most representative data available close to the Site. However, there is still some uncertainty on how representative that data can be across the entire air quality study area, when localised factors may affect meteorology and the dispersion of emissions. Therefore, five years of representative meteorological data have been used in the assessment to account for variability, in accordance with Environment Agency guidance.

6.4.10 The modelling of onsite and marine vessel emissions is informed by building dimensions data to account for the effect of building downwash within the dispersion modelling exercise. At this stage of project design, there is some uncertainty in the exact location and dimensions of onsite buildings and structures. To account for this uncertainty, some buildings and structures have been grouped together to be represented larger, collective structures, which will provide a precautionary means of accounting for building downwash in the model.

6.4.11 In the absence of alternative data, Defra background data (Ref 6-8) and Air Pollution Information Service (APIS) background data (Ref 6-2) has been used to represent background pollutant concentration data in the study area. These background concentrations have not had any sources removed and are therefore considered to include emissions associated with neighbours of the Site, including nearby industry and the Port of Immingham. Such an approach is considered proportionate and not unreasonable.

6.4.12 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further through the assessment and consultation processes, and as further research and investigative surveys are completed to fully understand its potential effects.

6.5 Study Area

6.5.1 The study area is the area over which potentially significant direct and indirect effects of the Project may occur during construction and operation (decommissioning having been screened out of the assessment).

6.5.2 The Project will be developed across several areas on and in close proximity to the Port of Immingham, which is an existing and well-established port with a number of existing sources of emissions to air. Onsite emissions associated with

the construction and operation of the Project will form a small proportion of the overall emissions associated with the Port of Immingham.

6.5.3 The study area for potential construction impacts from dust and particulate matter (particles with an aerodynamic diameter of less than 10 micrometres (PM_{10})) has been determined with reference to IAQM guidance (Ref 6-19). They are only likely to occur at locations where there are human health or amenity sensitive receptors within 350 m of the Site Boundary (taken to represent the construction site boundary in this assessment) and/or 50 m of a public road used by construction vehicles that is within 500 m of a site access point, and where there are sensitive ecological receptors within 50 m of the Site Boundary and/or 50 m of a public road used by construction vehicles that is within 500 m of a site access point.

6.5.4 Potential road traffic emissions impacts during construction and operation are only likely to occur where there are sensitive human and/or ecologically sensitive receptors within 200 m of an 'affected' road link (Ref 6-24). An 'affected' road link is defined by the following criteria:

a. Any urban or rural road link not situated within or adjacent to an Air Quality Management Area (AQMA) that will experience a change in two-way traffic flow of 500 or more annual average daily Light Duty Vehicles (LDV) (vehicles <3.5 tonnes) and/or 100 or more annual average daily Heavy Duty Vehicles (HDV) (all vehicles >3.5 tonnes), as defined within EPUK and IAQM guidance (Ref 6-25).

b. Any urban or rural road link that is situated within or adjacent to an AQMA that will experience a change in two-way traffic flow of 100 or more annual average daily LDVs and/or 25 or more annual average daily HDVs, as defined within EPUK and IAQM guidance (Ref 6-25).

c. Any road link that forms part of the Strategic Road Network (SRN) that will experience a change in two-way traffic flow of 1000 or more Annual Average Daily Traffic (AADT) and/or 200 or more annual average daily HDVs, as defined within National Highways guidance LA105 (Ref 6-18).

6.5.5 The study area for onsite point source emissions during operation is determined with reference to Environment Agency permitting guidance, in the absence of any alternative (Ref 6-13), which includes worst-case human health and nature conservation impacts within 10km of the emissions sources.

6.5.6 Vessel emissions impacts during construction and operation will occur close to the source. In the absence of guidance, the study area applied to the onsite point source emissions will apply to this source also. The assessment will focus on worst-case impacts at the nearest human health and/or ecologically sensitive receptors, where present, in each direction of the vessel sources.

6.5.7 The study area for the odour assessment is again determined by the guidance documents used to inform the assessment (Ref 6-3). The guidance document does not specifically refer to a study area based on any distance criteria from the site boundary. Instead, the odour study area can be assumed to include the nearest odour sensitive receptors in each direction from the Site.

6.5.8 The air quality ES chapter will, through further desk-based analysis and assessment, refine the study area for the purposes of the impact assessment.

6.6 Baseline Conditions

6.6.1 A desk-based study has been undertaken to inform the baseline characterisation on which the impact assessment is then based. This has included review of the following key data sources:

a. North East Lincolnshire Council Local Air Quality Management Data (Ref 6-28);

b. North Lincolnshire Council Local Air Quality Management Data (Ref 6-31);

c. A baseline nitrogen dioxide diffusion tube survey;

d. Defra's Pollution Climate Mapping (PCM) Model Compliance Link Outputs (Ref 6-9);

e. Defra's Background Pollutant Concentration Maps (Ref 6-8); and

f. APIS Background Pollutant Concentration Maps (Ref 6-2).

Local Air Quality Management Data

6.6.2 North East Lincolnshire Council undertake monitoring of air quality in their administrative area as part of their Local Air Quality Management duties. This includes the monitoring of nitrogen dioxide (NO_2) at two automatic monitoring sites and 30 passive monitoring sites. Of those monitoring sites, four are located at Immingham, including one of the automatic monitoring sites. In 2019, when conditions were not affected by the Covid-19 pandemic, concentrations ranged from 16.5 µg/m^3 to 24.5 µg/m^3 at roadside locations in the town and 13.5 µg/m^3 at an urban background location. Concentrations had generally returned to pre-pandemic levels in 2021. These data are summarised in **Table 6.6** and demonstrate concentrations below the air quality objective and below the value to suggest any risk of the one-hour NO_2 objective being exceeded.

6.6.3 North Lincolnshire Council also undertake monitoring of air quality within their administrative area using passive and automatic monitoring. The North Lincolnshire Council Annual Status Report (2020) details recorded annual mean NO_2 monitoring results for the past few years (Ref 6-31), including locations close to the A160 at South Killingholme. These data are summarised in **Table 6.7** and also demonstrate concentrations below the air quality objective and below the value to suggest any risk of the one-hour NO_2 objective being exceeded.

6.6.4 Both Councils (North East Lincolnshire Council and North Lincolnshire Council) have current AQMAs declared. One is located adjacent to the A180 through Grimsby and was designated due to elevated NO_2 concentrations, and another is located at Scunthorpe and was designated due to elevated concentrations of particulate matter (PM_{10}). Immingham itself has historically had an AQMA, close to the Port of Immingham on Kings Road, due to elevated concentrations of PM_{10}. However, this AQMA has been revoked to reflect PM_{10} concentrations that are now well below the relevant air quality objectives.

Table 6.6 Recorded NO_2 Concentrations in Immingham and Grimsby from North East Lincolnshire Air Quality Monitoring Network.

Site ID	Grid Reference		Site Type	NO_2 Annual Mean Concentration (µg/m³)[1,2]					
	X	Y		2015	2016	2017	2018	2019	2021
Immingham									
AURN[3]	518277	415116	Background	-	-	16.9	13.9	13.5	12.1
NEL 23[4]	519193	415279	Roadside	30.0	33.3	28.5	26.5	24.5	25.3
NEL 24[4]	517543	414312	Kerbside	-	-	-	-	16.5	15.0
NEL 25[4]	518108	414533	Kerbside	-	-	-	-	19.1	18.2
Cleethorpe Road AQMA, Grimsby									
Cleethorpe Road[2]	527761	410425	Roadside	**46.5**	**41.6**	35.9	-	32.0	33.4
NEL 11/12/13[5]	527761	410425	Roadside	**42.7**	**45.2**	**47.3**	38.0	37.8	39.1
NEL 14[4]	527754	410445	Kerbside	34.7	37.3	34.7	33.3	31.6	34.2
NEL 15[4]	527789	410438	Kerbside	30.8	35.7	37.3	32.9	31.0	35.8

[1] Values in **Bold** signify an exceedance of the annual mean NO_2 air quality objective

[2] Values for 2020 not reported due to the influence of Covid-19 lockdowns on emissions

[3] Continuous monitoring station with reference monitor

[4] Diffusion tube

[5] Triplicate diffusion tubes and average reported

Table 6.7 Recorded NO_2 concentrations in South Killingholme from North Lincolnshire Air Quality Monitoring Network

Site ID	Grid Ref.		Site Type	Annual Mean Conc. (µg/m³)[1,2,3]				
	X	Y		2015	2016	2017	2018	2019
South Killingholme								
CM6[4]	514880	416133	Other	20	17	17	18	15
DT13[5]	514573	415901	Roadside	26	31	20	17	17
DT14[5]	514782	415971	Roadside	34	31	27	28	29

Site ID	Grid Ref.		Site Type	Annual Mean Conc. (µg/m^3)[1,2,3]				
	X	Y		2015	2016	2017	2018	2019
DT15[5]	515452	416107	Background	19	21	19	20	18
DT16[5]	515279	416085	Roadside	27	26	25	26	25

[1] North Lincolnshire report concentrations as whole numbers

[2] Values for 2020 not reported due to the influence of Covid-19 lockdowns on emissions

[3] No data published by North Lincolnshire for 2021 at time of writing

[4] Continuous monitoring station with reference monitor

[5] Diffusion tube

Baseline Survey Data

6.6.5 To supplement the existing NO_2 monitoring data gathered by the Local Authorities in the study area, a project specific NO_2 survey has been undertaken from November 2021 to February 2022. The data gathered during the survey has been annualised and adjusted for diffusion tube bias in line with Defra's LAQM TG (22) guidance (Ref 6-7), to represent annual mean concentrations for 2019.

6.6.6 These results are summarised in **Table 6.8** and demonstrate concentrations below the air quality objective and below the value to suggest any risk of the one-hour NO_2 objective being exceeded.

Table 6.8 Baseline NO_2 survey results, annualisation and bias-adjustment

Diffusion Tube ID	Period Mean Concentration (µg/m^3)			Annualised Mean (2019)[1]	Bias-adjusted mean (2019)[2]
	Period 1 (9/11/21 – 6/12/21)	Period 2 (6/12/21 – 6/1/22)	Period 3 (6/1/22 – 3/2/22)		
DT1	26.5	20.4	25.0	20.0	16.8
DT2	36.2	28.3	36.8	28.2	23.7
DT3	-[3]	-[3]	-[3]	-	-
DT4	25.5	18.6	36.1	22.3	18.8
DT5	19.9	20.7	27.2	18.9	15.9
DT6	24.5	20.4	29.5	20.7	17.4
DT7	15.4	15.8	21.3	14.6	12.3
DT8	18.4	18.4	24.9	17.2	14.4
DT9	20.7	18.4	26.4	18.2	15.3

Diffusion Tube ID	Period Mean Concentration (µg/m^3)			Annualised Mean (2019)[1]	Bias-adjusted mean (2019)[2]
	Period 1 (9/11/21 – 6/12/21)	Period 2 (6/12/21 – 6/1/22)	Period 3 (6/1/22 – 3/2/22)		

[1] Annualisation factor of 0.83 calculated by comparison of period mean and 2019 annual mean concentrations from the following automatic monitoring stations on the Automatic Urban and Rural Network: Immingham and Hull Freetown.

[2] Bias-adjustment factor of 0.84 sourced from Defra's National Bias Adjustment Spreadsheet (Ref 6-9) calculated from a co-location study was undertaken during the survey at the Immingham AURN monitoring station, but ratified data from the AURN site for the survey period is not currently available.

[3] Diffusion tube not present when collected following exposure

Defra Pollution Climate Mapping (PCM) Model

6.6.7 The closest PCM link to the site is A1173 located approximately 120m from the western edge of the site. This link has a modelled concentration of 22.6 µg/m^3 in 2019 (Ref 6-9).

Defra Background Data

6.6.8 Defra has produced publicly available maps of background pollutant concentrations covering the whole of the UK, for the purpose of Local Air Quality Management. These maps provide a useful resource for locations where background monitoring data is limited. The maps give background pollutant concentrations for each 1 km x 1 km grid square within the UK for all years between 2018 and 2030 for NO_X, NO_2, PM_{10} and $PM_{2.5}$, and 2001 for SO_2.

6.6.9 **Table 6.9** outlines the average 2019 background concentrations of NO_X, NO_2, PM_{10} and $PM_{2.5}$, and the 2001 background for SO_2, within the grid squares where the Project is approximately located. The background concentration values account for existing sources of emissions to air within each and neighbouring grid squares and none of these sources have been removed from the values reported or those used to inform the assessment. Total background concentrations within these grid squares are well below the respective Air Quality Standards.

Table 6.9 Defra Mapped Annual mean Background Concentrations for approximate area of site (µg/m^3)

Grid Square		NO_X	NO_2	PM_{10}	$PM_{2.5}$	SO_2
X	Y					
521500	415500	22.4	15.8	14.0	8.5	3.5
520500	415500	23.6	16.7	13.5	8.4	3.6
519500	414500	23.1	16.3	15.2	8.9	2.9
520500	414500	21.8	15.5	14.4	8.6	3.0

APIS Background Data

6.6.10 APIS also publish publicly available maps of background pollutant data across the UK for pollutants including nitrogen deposition rates and NH_3 (Ref 6-2). The background concentrations are based on a 5 km x 5 km grid across the UK and include for existing sources of emissions to air within each and neighbouring grid squares.

6.6.11 **Table 6.10** provides 2019 background pollutant data (based on a 3-year average of 2018 – 2020 inclusive) for nitrogen deposition and NH_3 concentrations within the grid squares where the Project is approximately located. The background concentration values account for existing sources of emissions to air within each and neighbouring grid squares and none of these sources have been removed from the values reported or those used to inform the assessment. Background nitrogen deposition rates for short vegetation are just below the Critical Load for saltmarsh habitat, but above the Critical Load for coastal and floodplain grazing marsh. Background nitrogen deposition rates for tall vegetation are above the Critical Load for deciduous woodland. Background NH_3 concentrations are above the lower Critical Level but below the upper Critical Level.

Table 6.10 APIS Mapped Annual Mean Background Concentrations for approximate area of site (µg/m³)

Grid Square		Nitrogen Deposition Rate (kg N/ha/yr)		Annual Mean NH_3 Conc. (µg/m³)
X	Y	Short vegetation[1]	Tall vegetation[2]	
521500	415500	19.3	32.5	2.0
520500	415500	19.5	32.8	2.0
519500	414500	19.6	33.0	2.1
520500	414500	19.5	32.7	2.1

[1] Short vegetation, such as grassland and marsh, has a lower deposition velocity then tall vegetation, hence lower background deposition rates.

[2] Tall vegetation, such as woodland, has a higher deposition velocity than short vegetation, hence higher background deposition rates.

Future Baseline

6.6.12 In addition to describing the existing baseline environment, the air quality chapter of the ES will seek to explain what the environmental change, in air quality terms, would likely be in the future if the Project were not to go ahead.

6.6.13 It is anticipated that this will show a general decrease in pollutant concentrations and deposition rates over future years. Whilst other developments may increase the number of emission sources in the area, there is a general trend of reducing pollutant concentrations and deposition rates over time, due to improving

emission technology and the evolution of the vehicle fleet and other emissions sources.

6.6.14 The East Site is adjacent to and the West site close to the operational Port of Immingham, which has been in active use for port purposes for a number of decades and will continue to do so into the future. The current use of the site for bulk cargo, steel sections, lorry and automotive storage is also likely to continue into the future.

6.7 Development Design and Impact Avoidance

6.7.1 The Project has been designed, as far as possible, to avoid and minimise impacts and effects to population and health through the process of design development, and by embedding mitigation measures into the design.

6.7.2 Emissions to air and potential impacts at sensitive locations are mitigated by direct and indirect control measures including those embedded within the Project design. These include, but are not limited to:

a. Project layout design and the locating of onsite sources with consideration of nearby air quality sensitive receptors, including the position of the jetty and docked vessels;

b. Closed system for ammonia handling with leak detection;

c. Emergency flares to burn off NH_3 or hydrogen emissions should the need arise; hydrogen flares will also be used in plant start up and shut down

d. Emissions release heights to encourage optimal dispersion;

e. Use of electricity powered steam raising plant;

f. Demonstration of the application of best available techniques in plant design and operation as part of the environmental (EPR) permit;

g. The enforcement of relevant emissions standards including those set by MARPOL for Marine Vessels; and

h. Measures set out within the Construction Environmental Management Plan (CEMP) and Construction Traffic Management Plan (CTMP) will reduce emissions of dust from construction activities and combustion emissions from traffic movements. It should be noted that the description of impacts presented in **Section 6.8** do not account for the measures set out in the CEMP and CTMP.

6.8 Potential Impacts and Effects

Construction Phase

6.8.1 The preliminary assessment has identified that the construction of the Project has the potential to adversely impact on local air quality at sensitive locations in the vicinity of the Site.

6.8.2 These impacts are associated with the following pathways:

a. Dust emissions;

b. Site plant and NRMM emissions;

c. Vessel emissions; and

d. Traffic emissions.

Construction Dust Emissions

6.8.3 The construction dust assessment follows the step-by-step approach set out in relevant IAQM guidance (Ref 6-19). This process is summarised in the sub-sections below.

6.8.4 It is anticipated that the construction of the Project will be undertaken in six phases and will last for approximately 11 years. The construction dust assessment is based on a single time-slice assuming peak construction activity and is conservatively used to represent all 11 years of construction.

6.8.5 Peak construction will occur during phase 1 of the construction works, which will last for approximately three years and include the following works:

a. Construction of jetty structure and berths;

b. Laying of jetty access road and other internal site access roads;

c. Construction of jetty topside infrastructure;

d. Installation of pipelines;

e. Drainage, utilities and cabling;

f. Construction of one West Site liquefier;

g. Construction of West Site Tanker loading bays;

h. Construction of West Site supporting buildings and facilities;

i. Construction of East Site ammonia tank; and

j. Construction of one East Site hydrogen production unit

6.8.6 Phases 2 – 6 will each have a duration of two years and collectively occur over a period of eight years, if built consecutively. These phases relate to increasing the capacity of the facility, with the installation of two additional hydrogen production units on the West Site, and three hydrogen production units and three liquefiers on the East Site. Due to the length of time over which these activities will occur, the construction works during Phases 2 – 6 will be less intensive than those undertaken during Phase 1.

Step 1 Screen the requirement for a detailed assessment

6.8.7 Step 1 of the guidance is to screen the requirement for a more detailed assessment. According to the guidance, no further assessment is required if there are no receptors within a specified distance of the works. The screening distances set by the IAQM guidance are:

a. Receptors sensitive to amenity and human health impacts within 350 m of the construction site boundary and/or within 50 m of a public road used by construction traffic that is within 500 m of the site entrance; and

b. Nature conservation receptors located within 50 m of the construction site boundary and/or within 50 m of a public road used by construction traffic that is within 500 m of the site entrance.

6.8.8 There are a number of nature conservation receptors within 50 m of the construction site boundary, including the high sensitivity Humber Estuary Special Area of Conservation (SAC)/Special Protection Area (SPA), which is immediately adjacent to the north and north-eastern sections of the site.

6.8.9 The nearest human health sensitive receptors are residential properties and local businesses located on Queens Road along the northern boundary of the West Site.

6.8.10 Due to the presence of the high sensitivity amenity, human health and nature conservation sensitive receptors within the screening distances set by the guidance, the more detailed assessment is required and is set out in the following steps.

Step 2 Assess the Risk of Dust Impacts

Step 2A Determine the Dust Emissions Magnitude

6.8.11 Step 2A requires the determination of the dust emission magnitude, which the guidance states is based on the scale of the anticipated works with the following activities: demolition; earthworks; construction (i.e. the building and erection of structures); and trackout (the deposition of dust and particulate matter onto public roads by construction vehicles), and should be classified as Small, Medium, or Large.

6.8.12 The scale of demolition works is likely to be limited, given the current land uses across the Project site. However, a worst-case scenario is assumed for this activity. The dust emission magnitude for the proposed demolition works is classed as Large.

6.8.13 The Site is anticipated to require earthworks associated with soil-stripping, ground levelling and excavation works. Whilst the total ground area of earthworks is currently undefined, it is likely to exceed the highest criteria set by the IAQM guidance (>10,000 m^2). It is also anticipated that there could be more than ten heavy earth moving vehicles in operation at any one time. As such the dust emissions magnitude of effect for earthworks is classed as Large.

6.8.14 Potentially dusty materials that may be in use during construction works are concrete (if delivered dry), sand and hard core, which will be stored and handled at the Site throughout the construction phase. The volume of the construction work is currently undefined; however, it is likely to exceed the highest criteria set by the IAQM guidance (>100,000 m^3). Therefore, the worst-case scenario is assumed. As such, the dust emissions magnitude of effect for construction is classed as Large.

6.8.15 Trackout is associated with the deposition of mud and potentially dusty material onto the public network from construction vehicles leaving the Site. On any one day, there is considered to be a high possibility that there will be more than 50

outward construction related HDV (all vehicles > 3.5 tonnes) movements. The assigned dust emission magnitude for trackout is classed as Large.

Step 2B Determine the Sensitivity of the Area

6.8.16 Step 2B of the IAQM construction dust guidance requires the determination of the sensitivity of the area to construction dust impacts. According to the guidance, this is based on the sensitivity of individual receptors, the proximity and number of those receptors, background PM_{10} concentrations and site-specific factors, such as local terrain, meteorology, and natural and existing windbreaks.

6.8.17 The limited number of receptors combined with their proximity to the Site, means that the sensitivity of the area to dust soiling effects on people and property is Medium.

6.8.18 Background PM_{10} concentrations are estimated to be 13 – 15 µg/m^3 and this, coupled with the limited number of receptors and their proximity to the Site, means that the sensitivity of the area to human health impacts is Low.

6.8.19 The proximity of the Humber Estuary SAC/SPA means that there is a high sensitivity nature conservation receptor within 20 m of the construction site boundary. However, the areas of the SAC/SPA that are within 20 m of the Site Boundary are tidal mudflats, which are not considered sensitive to construction dust impacts, due to any material deposited being washed away with the retreating tide.

Step 2C Determine the Risk of Dust Impacts

6.8.20 Step 2C of the IAQM construction guidance concerns the determination of the risk of dust impacts, which is informed by the dust emission magnitude identified in Step 2A and the sensitivity of the area identified in Step 2B.

6.8.21 The risk of dust impacts is shown in **Table 6.11**.

Table 6.11 Summary Dust Risk Table

Potential Impact	Risk			
	Demolition	Earthworks	Construction	Trackout
Dust soiling	High	Medium	Medium	Medium
Human health	Medium	Low	Low	Low
Nature Conservation	High	Medium	Medium	Medium

6.8.22 Following the determination of dust risk, the level of mitigation is confirmed to control dust emissions to the extent that the effect of impacts is not significant. Mitigation measures are described in **Section 6.9**. Without the application of the identified level of mitigation, there is the potential for the effect of construction impacts to be **Significant**.

Non-Road Mobile Machinery (NRMM) and Site Plant

6.8.23 Peak construction will occur during phase 1 and the NRMM and site plant anticipated to be onsite across the Pipeline, West Site and East Site, at any one during this phase of the works, is likely to include:

a. 4 x Crawler crane;
b. 6 x Truck crane, capacity <100Te;
c. 6 x Truck crane, capacity >100 t;
d. 6 x Telehandler;
e. 4 x Diesel generator 550 kW;
f. 4 x Diesel generator 450 kW;
g. 4 x Transformer 2x630 kW;
h. 10 x Piling rig;
i. 20 x Concrete mixer;
j. 3 x Pump;
k. 4 x Caterpillar type tracked front loader;
l. 4 x Caterpillar 226 Bobcat;
m. 2 x JCB type wheel loaders / excavators;
n. 6 x Excavators;
o. 6 x Dumpers;
p. 2 x Rollers;
q. 12 x Four-axle dump truck;
r. 2 x Three-axle dump truck;
s. 4 x 3-5t truck; and
t. 4 x Pickup.

6.8.24 The NRMM and site plant listed above may be present onsite at the same time, but will not all be operational simultaneously. Furthermore, operation of all individual NRMM and site plant is limited to as and when required, within the working day.

6.8.25 The West Site is located immediately adjacent to a small number of residential properties (c.10) alongside its northern boundary, on Queens Road. Beyond those, the nearest residential properties are located on Chestnut Avenue, 450m away to the west. The Queens Road properties are also the nearest air quality sensitive receptors to the Pipeline works area, and the East Site works area, albeit with a greater setback distance (c.100m to the nearest property from the Pipeline works area and 750m from the East Site works area).

6.8.26 Whilst the properties on Queens Road are in close proximity to the West Site boundary, they do experience some setback from the main area of works within that site. Any NRMM machinery or site plant that is operational within 100m of

those properties will only be for a limited number of days or weeks at most, with the vast majority of operations occurring within the works area being more than 100m away.

6.8.27 The East Site works area is immediately adjacent to the SAC, although the nearest sections of the SAC to the Site are not considered sensitive to air quality impacts. The nearest nature conservation sensitive locations are saltmarsh habitat, approximately 3km away to the southeast.

6.8.28 In light of this, the intermittent nature of NRMM and site plant emissions, and the limited number of receptors close enough to be potentially impacted upon, it is considered that the effect of impacts from this source are **not significant**, before mitigation. NRMM and site plant emissions would not contribute to a significant effect on local air quality.

Marine Vessel Emissions

6.8.29 Peak construction vessel operation will also occur during Phase 1, when the jetty structure and berths, and jetty topside infrastructure will be constructed. Anticipated construction phase vessels will comprise of:

a. 1 x Backhoe dredger;
b. 1 x Jackup barge;
c. 2 x Floating barges;
d. 2 x Multicats;
e. 6 x Flat-top barges; and
f. 1 x Safety boat.

6.8.30 Not all of these vessels will be in use at any one time, and, with the exception of the dredger, operations and/or emissions of individual vessels will be periodic and intermittent.

6.8.31 The closest human health sensitive receptors to the construction phase vessel working area are the residential properties on Queens Road, approximately 1.5 km away from the nearest marine works and 2.5 km away from the furthest marine works.

6.8.32 The construction vessel working area is immediately adjacent to the Humber Estuary SAC, although, as previously noted, the nearest sections of the SAC to the Site are not considered sensitive to air quality impacts and the sensitive locations of the SAC are the saltmarsh habitat, approximately 3km away to the northeast and 3km to the southeast.

6.8.33 Given the limited number of construction vessel emissions sources, the frequency of operation and distance between source and sensitive receptors, it is considered highly likely that the effect of unmitigated impacts from this source would be **not significant**. Construction vessel emissions would not contribute to a significant effect on local air quality.

Road Traffic Emissions

6.8.34 Peak construction traffic impacts will occur across the three years of Phase 1 of the construction works. During that Phase, there is anticipated to be an annual average of 195 two-way HDV movements visiting the construction site per day. All 195 two-way movements will approach to and from the site via Queens Road, Kings Road and the A1173. Construction phase HDVs will approach the A1173 to and from the A180, which forms part of the SRN. The A180 will experience maximum two-way HDVs of 106 movements per day to the west of the A1173 junction.

6.8.35 The two-way construction phase HDV movements on the A180 and SRN fall below the National Highways guidance criteria of 200 two-way HDV movements per day to suggest that they could not contribute to a significant effect. However, the two-way HDV movements on the local road network, between the A180 and the site entrances on Queens Road, exceed the IAQM and EPUK guidance criteria (Ref 6-25) of 100 two-way HDV movements per day to suggest that they could potentially contribute to a significant effect.

6.8.36 On this construction route, sensitive exposure to construction HDV emissions is only present on a short section of Queens Road where there are eight residential properties. Baseline air quality has been quantified by means of NO_2 monitoring and review of background pollutant conditions for NO_2, PM_{10} and $PM_{2.5}$ at this location. Existing conditions suggest that air quality at this location on Queens Road is of a good standard (see **Table 6.8**). The emissions associated with c.200 additional HDV movements per day will not increase concentrations of NO_2, PM_{10} and $PM_{2.5}$ to the extent that the air quality objectives will be put at risk of exceedance.

6.8.37 In line with National Highways guidance, and following review of baseline air quality on Queens Road, it is considered that the construction phase traffic impact is unlikely to contribute to a significant effect on local air quality. Before mitigation, the effect of construction phase road traffic emissions impact is **not significant**.

Operational Phase

6.8.38 This section contains an assessment of the potential impacts to air quality as a result of the operational phase of the Project. The following impact pathways have been assessed:

a. Onsite marine-side vessel emissions and landside combustion and process emissions;

b. Road traffic emissions; and

c. Odour emissions.

Marine Vessel Emissions and Landside Plant Emissions

6.8.39 The impact of docked vessel emissions and onsite plant emissions has been quantified at the nearest air quality sensitive human health and nature conservation receptors in the vicinity of the Site. The approach to the assessment

is described in detail in **Appendix 6.B** (PEI Report, Volume IV). The assessment is based on the following key assumptions, which will be reviewed and updated, where required, in the ES:

a. There will be two vessels docked at the facility, using both berths, at any one time for 8760 hours of the year, which produces a worst case assessment;

b. When in dock, vessel energy demand will be met by auxiliary engines based on a peak demand of around 8MW, to load and discharge cargo;

c. That 50% of docked vessel engines will be fuelled by LNG and 50% fuelled by MGO;

d. That MARPOL Tier II emissions standards shall apply;

e. Combustion and process emissions associated with the landside hydrogen production units will be operational up to 8760 hours per year;

f. Hydrogen plant will be fitted with Selective Catalytic Reduction technology to reduce emissions of NO_X;

g. Furnaces will initially be gas-fired, but hydrogen or biogas may be used in future

h. Steam raising will be performed using electricity rather than gas, removing the requirement for gas or diesel-fired steam generating plant; and

i. Combustion emissions associated with flares will be operational on pilot mode for 8760 hours per year and on operational mode for approximately 365 hours per year.

6.8.40 The impact of marine vessel emissions and landside plant emissions on the worst-affected human health sensitive receptors considered in this assessment is provided in **Table 6.12**. Impacts provided are for annual mean and hourly mean NO_2. Impact for other pollutants modelled account for less than 1% of the relevant air quality objectives. The impact predicted at other human health sensitive receptors for all pollutants modelled are provided in **Appendix 6.B** (PEI Report, Volume IV).

Table 6.12 Worst-affected Human Health Receptor Impacts

Pollutant	Impact (µg/m^3)	Impact/AQO (%)	Baseline (µg/m^3)	Total Conc. (µg/m^3)	Total Conc./AQO (%)
Annual Mean NO_2	1.2	3	15.5	16.7	42
Hourly Mean NO_2	27.3	14	31.0	58.3	29.1

6.8.41 At the worst affected human health sensitive receptor (R12, located on Queens Road), a change in annual mean NO_2 concentration of 5% or less of the annual mean air quality objective, at a location where total pollutant concentrations with the Project in operation account for 75% or less of the objective, equates to a

negligible impact which is considered to be **not significant**. This is in accordance with the IAQM and EPUK guidance referred to in this assessment (Ref 6-25).

6.8.42 For hourly mean NO_2, a change of between 11% and 20% of the air quality objective is described as a slight adverse impact in IAQM and EPUK guidance. A slight adverse impact is considered to be **not significant**. As explained in **Chapter 22: Major Accidents and Disasters**, **Table 22.2**, further assessment is required of the consequences of the operation of the hydrogen production facility on surrounding land uses in terms of major hazard planning. It is currently anticipated that the HSE will advise against the continued use of the seven residential properties on the west side of Queens Road and therefore that those properties are likely to need to be acquired for the Project. The Applicant is currently in discussions with those landowners / occupiers with a view to negotiating acquisition of the seven residential properties. Where it is not possible to acquire those properties through negotiation, acquisition powers for these properties will be sought through the DCO. In the event of acquisition of the properties ahead of the either construction or operation commencing, the adverse effect would not arise.

6.8.43 Marine vessel and site plant emissions would not contribute to a significant effect on local air quality.

6.8.44 The impact of marine vessel emissions and landside plant emissions on the selected nature conservation sensitive receptor considered in this assessment is provided in **Table 6.13**.

Table 6.13 Worst Affected Nature Conservation Receptor Impacts (µg/m^3)

Pollutant	Impact	Impact/AQO (%)	Baseline[1]	Total Conc.	Total Conc./AQO (%)
Annual Mean NO_X	3.3 µg/m^3	11	18.1 µg/m^3	21.4 µg/m^3	71
Annual Mean NH_3	0.01 µg/m^3	<1[2]	2 µg/m^3	2.01 µg/m^3	201[2]
Annual Mean SO_2	<0.01 µg/m^3	<1	2.2 µg/m^3	2.2 µg/m^3	11
Annual N Deposition Rate[3]	0.4 kgN/ha/yr	2	18.7 kgN/ha/yr	19.1 kgN/ha/yr	96

[1] As reported by APIS

[2] Assuming lichens or bryophytes (including mosses, liverworts and hornworts) are present

[3] NO_2 + NH_3 contribution

6.8.45 At the worst affected nature conservation receptor (E11, saltmarsh habitat on the northern shore of the Estuary), the change in annual mean NH_3 and SO_2 can be screened as insignificant (‘not significant’) in line with Environment Agency

guidance. However, the annual mean NO_X concentration and annual N deposition rate cannot be screened as insignificant ('not significant). For these pollutants, the impacts at the relevant habitats affected have been reviewed by the competent experts for ecology (also presented in **Chapter 9: Marine Ecology**) and they have determined the following:

a. For saltmarsh, the APIS provides a Critical Load range of 20-30 kg/ha/yr and nitrogen inputs have been experimentally demonstrated to have an effect on overall species composition of saltmarsh. However, the Critical Loads on APIS are relatively generic for each habitat type and cover a wide range of deposition rates. They do not (and are not intended to) take other influences (to which the habitat on a given site may be exposed) into consideration.

b. Moreover, it is important to note from APIS that the experimental studies which underlie conclusions regarding the sensitivity of saltmarsh have "… *neither used very realistic N doses nor input methods i.e. they have relied on a single large application more representative of agricultural discharge"*, which is far in excess of anything that would be deposited from atmosphere. Therefore, APIS indicates that determining which part of the critical load range to use for saltmarsh requires expert judgment. Overall, there is good reason to believe the upper part of the critical load range (30 kgN/ha/yr) may be more appropriate than the lower part (20 kgN/ha/yr) for upper saltmarsh.

c. Generally, nitrogen inputs from the air are not as important as nitrogen from other sources. Effects of nitrogen deposition from atmosphere are likely to be dominated by much greater impacts from marine or agricultural sources. This is reflected on APIS itself, which states regarding saltmarsh that '*Overall, N deposition [from atmosphere] is likely to be of low importance for these systems as the inputs are probably significantly below the large nutrient loadings from river and tidal inputs'*. Another mitigating factor is that the nature of intertidal saltmarsh in the Humber estuary means that there is daily flushing from tidal incursion. This is likely to further reduce the role of nitrogen from atmosphere in controlling botanical composition.

d. Therefore, the additional predicted contribution from nitrogen emissions from the Project does not result in any exceedance of the Critical Load range for saltmarsh, and it is concluded that there will be no adverse effect on the Humber Estuary designated site.

6.1.2 Before mitigation, marine vessel and site plant emissions would not contribute to a significant effect on nature conservation.

Road Traffic Emissions

6.8.46 At this preliminary stage, only limited information of operational traffic movements is available, including the number of staff working at the facility each day and some anticipated numbers of HDV movements facilitating imports and exports to the site, and maintenance.

6.8.47 From the data currently available, it is likely that operational traffic impacts will fall below the IAQM and EPUK guidance (Ref 6-25) of 100 two-way HDV movements per day and the National Highways guidance (Ref 6-18) of 200 two-way HDV

movements per day. It is currently anticipated that there will be 96 two-way HDV movements into and out of the site. Also, if assuming all staff working at the site commute to and from site using their own car, 208 two-way LGV movements.

6.8.48 In line with those guidance documents, a traffic impact of less than the screening criteria that they set out is unlikely to contribute to a significant effect on local air quality or sensitive nature conservation sites. Before mitigation, the effect of operational phase road traffic emissions impact is **not significant**.

Odour

6.8.49 The odour impact assessment is summarised in **Table 6.14**. The table sets out the factors used to determine the likely odour impacts and resulting effect from Project sources. It follows the stepped approach described in IAQM guidance (Ref 6-20).

Table 6.14 Odour Impact Assessment

IAQM Guidance Criteria	Assessment of Project Conditions
A description of existing baseline odour conditions.	The Project East Site is located adjacent to the eastern extent of the Port of Immingham and has existing industrial facilities as neighbours, including petroleum storage and chemical manufacturing. The wider port area, petroleum storage and chemical manufacturing are likely to be existing sources of odour emissions. The East Site also has a small Sewage Treatment Works nearby, which will be a source of odour. The Project West Site is also close to the Port of Immingham and has some existing industrial facilities as neighbours, including the manufacture of building products. The West Site also has a household recycling centre nearby, which will be a source of odour.
A description of the location of receptors and their relative sensitivities to odour effects.	The nearest receptors to the Project East Site are the existing commercial and industrial land uses. These are considered to have a low sensitivity to odour impacts. The nearest receptors to the West Site are residential properties on Queens Road. These are considered to have a high sensitivity to odour impacts.
Details of potential odour sources and the resulting potential for generating odours.	Sources are limited to fugitive emissions of NH_3 from potential leaks and controlled emissions from stacks and vents. Emissions from leaks will be intermittent and short in duration. Emissions from stacks will be continuous, but the proportion of NH_3 is minimal.
A description of control/mitigation measures incorporated into the scheme (including management controls and, where appropriate, engineering controls).	To control fugitive emissions, a leak detection system will be in place, meaning that leaks can be identified and repaired quickly. The flares are used to combust any ammonia that would otherwise be released to atmosphere, thereby removing any odorous content from the emission.

IAQM Guidance Criteria	Assessment of Project Conditions
	To control emissions from stacks, emissions are released from such a height that dispersion is encouraged and combustion temperatures are such that NH_3 emissions are minimised.
A prediction of the likely odour impact and resulting effects at relevant sensitive receptors, and taking into account: a. the likely magnitude of odour emissions (after control by measures incorporated into the scheme, if applicable); b. the likely meteorological characteristics at the site; c. the dispersion and dilution afforded by the pathway to the receptors and the resulting magnitude of odour that could result; d. the sensitivity of the receptors; and e. the potential cumulative odour effects with any odours of a similar character.	a. Wind rose plots from Humberside Airport over a five year period (see **Appendix 6.B**, PEI Report, Volume IV) demonstrate the greatest frequency of winds blow from the southwest to the northeast across a narrow vector from 190º to 230º. Although winds do blow from all other directions at times during the year. b. Both the East Site and the West Site and surrounding area are reasonably flat with limited natural or artificial barriers. c. There is limited distance between the East Site and the West Site boundaries and the nearest odour sensitive receptors, although there will be some setback from potential odour emissions. Over such distances there will be some potential for the dilution of emissions. d. The majority of receptors in close proximity to both the East Site and the West site are commercial or industrial land used with limited sensitivity to odour impacts. There are a limited number of high sensitivity residential properties (c.10) adjacent to the West Site, on Queens Road. e. There are numerous cumulative sources of odour emissions in the area, although those existing sources are unlikely to be of a similar character.
Where odour effects are assessed as significant, details of appropriate further mitigation and control measures that could allow the proposal to proceed without causing significant loss of amenity.	Given the limited nature of emissions associated with the Project's operation and control measures incorporated into the Project design, a significant odour effect is considered to be unlikely. Before additional mitigation, the effect of operational phase road traffic emissions impact is **not significant**. However, to demonstrate good practice, and to demonstrate compliance with its Environmental Permit, the operation of the Project will be subject to an Odour Management Plan. Such a Plan would set out: a. Additional odour control requirements beyond those incorporated in the Project design; b. Establish best practice processes; c. Assign responsibilities, including record keeping; and d. Set out the odour monitoring regime, including the frequency of sniff tests, the monitoring of meteorological conditions, maintaining an odour diary and logging and investigating complaints.
The residual odour impacts and their effects	Given the nature of the potential odour sources, the control measures incorporated into the Project design, and the

IAQM Guidance Criteria	Assessment of Project Conditions
	commitment to review odour throughout the operational lifetime of the Project facility, the residual impacts considered not likely to contribute to a significant effect.

6.9 Mitigation and Enhancement Measures

Construction Phase

Construction Dust Emissions

Step 3 Determine Site Specific Mitigation

6.9.1 Step 3 of the IAQM construction dust guidance uses the risk of dust impacts identified in Step 2C to compile an appropriate list of dust mitigation to offset that risk and ensure that a significant effect does not occur. The IAQM guidance relevant to the construction dust assessment (Ref 6-19) lists measures that should be applied, if practical, relative to the risk identified.

6.9.2 A Low/ Medium risk of dust impacts was identified due to the potential dust emission magnitude and the sensitivity of the area. Therefore, the list of IAQM recommended mitigation measures provided below is proportionate to the risk identified. These measures will be secured through the CEMP. The IAQM recommended dust (and particulate matter) mitigation measures for low and medium risk sites are as follows:

a. Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;

b. Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager;

c. Display the head or regional office contact information;

d. Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real-time PM_{10} continuous monitoring and/or visual inspections;

e. Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken;

f. Make the complaints log available to the local authority when asked;

g. Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book;

h. Hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/ deliveries which might be using the same strategic road network routes;

i. Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary, with cleaning to be provided if necessary;

j. Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked;

k. Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions;

l. Agree dust deposition, dust flux, or real-time PM_{10} continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it is a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction;

m. Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;

n. Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;

o. Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;

p. Avoid site runoff of water or mud;

q. Keep site fencing, barriers and scaffolding clean using wet methods;

r. Remove materials that have a potential to produce dust from the Site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below;

s. Cover, seed or fence stockpiles to prevent wind whipping;

t. Ensure all on-road vehicles comply with the requirements of relevant NRMM standards, where applicable;

u. Ensure all vehicles switch off engines when stationary - no idling vehicles;

v. Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable;

w. Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control

measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate);

x. Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials;

y. Implement a Travel Plan that supports and encourages sustainable travel (public transport, cycling, walking, and car-sharing);

z. Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;

aa. Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;

bb. Use enclosed chutes and conveyors and covered skips;

cc. Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate;

dd. Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods;

ee. Avoid bonfires and burning of waste materials;

ff. Soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust);

gg. Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground;

hh. Avoid scabbling (roughening of concrete surfaces) if possible;

ii. Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;

jj. Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery;

kk. For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust;

ll. Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;

mm. Avoid dry sweeping of large areas;

nn. Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport;

oo. Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;

pp. Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable);

qq. Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits; and

rr. Access gates to be located at least 10m from receptors where possible.

Other Construction Phase Emissions

6.9.3 It is best practice to mitigate emissions to air, when possible, even if a significant effect has not been identified. Additional mitigation measures to reduce emissions from construction phase vessel and road traffic emissions sources include:

a. Prohibit unnecessary vehicle or vessel movements;

b. Prohibit unnecessary idling of vehicle and vessel engines;

c. Encourage/promote the use of cleaner engines and fuels; and

d. Discourage single-user car journeys.

Operational Phase

6.9.4 As stated previously, it is best practice to mitigate emissions to air, when possible, even if a significant effect has not been identified. Mitigation to reduce operational phase sources include:

a. Implementation of an Odour Management Plan;

b. Prohibit unnecessary vehicle or vessel movements;

c. Prohibit unnecessary idling of vehicle and vessel engines;

d. Encourage/promote the use of cleaner engines and fuels;

e. Operational process control and monitoring of emissions in accordance with the environmental permit; and

f. Discourage single-user car journeys.

6.9.5 The need for further operational phase mitigation, if any, will be confirmed and reported within the Environmental Statement.

6.10 Preliminary Assessment of Residual Effects

6.10.1 Based on the implementation of the embedded and standard mitigation measures as detailed herein, this preliminary assessment of local air quality effects for the Project is summarised below.

Construction Phase

Construction Dust Emissions

6.10.2 Step 4 of the IAQM construction dust guidance (Ref 6-19) is to determine whether or not the effects, after the application of the identified level of mitigation are, significant or not. The IAQM guidance states that:

"For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'".

6.10.3 Therefore, providing a sufficient level of dust mitigation is implemented on site throughout the works, with reference to those recommended by the IAQM, which are considered standard practice on all well managed construction sites, and secured through the CEMP, it is considered that the residual construction effects from the Project are **not significant**.

NRMM and Site Plant Emissions

6.10.4 A review of site plant and NRMM has deemed that impacts are likely to be **not significant**, in line with the IAQM guidance (Ref 6-19), for the following reasons:

a. The transient and intermittent nature of emissions;

b. The limited number of emissions sources;

c. The distance between emission sources and the nearest high sensitivity receptors; and

d. The effectiveness of standard practice emission control measures.

Construction Vessel Emissions

6.10.5 A review of construction vessel emissions has deemed that impacts are likely to be **not significant**, for the following reasons:

a. The number of vessel movements falls well below the number stipulated in Defra guidance (Ref 6-25) to represent a Local Air Quality Management concern;

b. The limited number of emissions sources; and

c. The distance between emission sources and the nearest high sensitivity receptors.

Construction Road Traffic Emissions

6.10.6 Anticipated construction phase traffic impacts have been screened against criteria in relevant guidance. This screening exercise has identified that no SRN road link will experience a traffic impact above the screening criteria. Baseline air quality has been reviewed for sensitive locations that are adjacent to the local road network used by construction traffic. Baseline air quality is such that the additional emissions from construction traffic are unlikely to put any air quality objective at risk of exceedance. This indicates that construction traffic emissions

impacts will not contribute to a significant effect and in themselves are **not significant**.

Operational Phase

Operational Site and Vessel Emissions

6.10.7 Emissions from site plant and operational vessel emissions have been quantified. Impacts at human health sensitive receptors have been found to be negligible and the effect **not significant**.

6.10.8 Impacts at the majority of designated nature conservations sites are screened as **not significant**. However, a section of saltmarsh habitat within the SAC, to the north and downwind of the Project site, does experience an impact of more than 1% of the Critical Load for that habitat.

6.10.9 This potential impact has been reviewed by an ecologist. The predicted Process Contribution from nitrogen emissions from the Project does not result in any exceedance of the upper Critical Load range for saltmarsh, and it is concluded that there will be no residual adverse effect on the Humber Estuary designated site.

Operational Road Traffic Emissions

6.10.10 Anticipated operational phase traffic impacts have been screened against criteria in relevant guidance. This screening exercise has identified that no road link will experience a traffic impact above the screening criteria. This in turn indicates that operational traffic emissions impacts will not contribute to a significant effect and in themselves are **not significant**.

6.11 Summary of Preliminary Assessment

6.11.1 A summary of the impact pathways that have been assessed, and the identified residual effects and level of confidence are presented in **Table 6.15.**

Table 6.15: Summary of potential impact, mitigation measures and residual effect

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Impact	Confidence
Construction Phase					
Human health and amenity sensitive receptors	Construction dust emissions	Low – High Risk	Standard practice dust mitigation as recommended by the IAQM, outlined in **Section 6.7**	Low	High – assessment based on industry standard guidance and precautionary assumptions
	Site Plant and NRMM emissions	Low	Standard practice mitigation as recommended by the IAQM, outlined in **Section 6.7**	Negligible	High – assessment based on industry standard guidance and precautionary assumptions
	Marine vessel emissions	Negligible	Good practice mitigation outlined in **Section 6.7**	Negligible	Medium – conclusion drawn on professional judgement informed by the number of construction vessels and the distance between those vessels and the nearest highly sensitive receptors
	Road traffic emissions	Negligible	Good practice mitigation outlined in **Section 6.7**	Negligible	High – detailed assessment screened following criteria provided in industry standard guidance and review of baseline air quality
Nature conservation sensitive receptors	Construction dust emissions	Low – High Risk	Standard practice dust mitigation as recommended by the	Low	High – assessment based on industry standard guidance and precautionary assumptions

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Impact	Confidence
			IAQM, outlined in **Section 6.7**		
	Site Plant and NRMM emissions	Low	Standard practice mitigation as recommended by the IAQM, outlined in **Section 6.7**	Negligible	High – assessment based on industry standard guidance and precautionary assumptions
	Marine vessel emissions	Negligible	Good practice mitigation outlined in **Section 6.7**	Negligible	Medium – conclusion drawn on professional judgement informed by the number of construction vessels and the distance between those vessels and the nearest highly sensitive receptors
	Road traffic emissions	Negligible	Good practice mitigation outlined in **Section 6.7**	Negligible	High – detailed assessment screened following criteria provided in industry standard guidance
Operational Phase					
Human health and amenity sensitive receptors	Marine-side vessel and landside combustion and process emissions	Negligible	Good practice mitigation outlined in **Section 6.7**	Negligible	High – assessment based on industry standard guidance and precautionary assumptions
	Road traffic emissions	Negligible	Good practice mitigation outlined in **Section 6.7**	Negligible	High – detailed assessment screened following criteria provided in industry standard guidance

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Impact	Confidence
	Odour emissions	Low	Standard practice odour mitigation as recommended by the IAQM, outlined in **Section 6.7**	Negligible	High – assessment based on industry standard guidance
Nature conservation sensitive receptors	Marine-side vessel and landside combustion and process emissions	Low	Good practice mitigation outlined in **Section 6.7**	Low	High – assessment based on industry standard guidance and precautionary assumptions
	Road traffic emissions	Negligible	Good practice mitigation outlined in **Section 6.7**	Negligible	High – detailed assessment screened following criteria provided in industry standard guidance

6.12 References

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6.13 Abbreviations and Glossary of Terms

Table 6.16 Glossary and Abbreviations

Acronym	Term	Meaning
AADT	Annual Average Daily Traffic	Annual average daily traffic flow (AADT or AADF) is the total volume of vehicle traffic on a highway or road for a year divided by 365 days. AADT is a useful and simple measurement of how busy a road is.
ABP	Associated British Ports	One of UK's leading and established connected ports groups, owning and operating 21 ports across England, Wales and Scotland.
AQMA	Air Quality Management Area	Zones declared by Local Authorities where areas of relevant exposure exceed or are at risk of exceeding an air quality objective
AQS	Air Quality Strategy	The air quality strategy sets out air quality objectives and policy options to further improve air quality in the UK.
CAFE	Clean Air For Europe	In May 2001, the European Commission launched its " Clean Air for Europe " (CAFE) programme. This is a three-year programme intended to investigate all sources of air pollution and provide solutions to reduce them.
CAZ	Clean Air Zone	A Clean Air Zone is an area in which a local authority has brought measures into place to improve the air quality.
CEMP	Construction Environment Management Plan	A Construction Environmental Management Plan describes the specific mitigation measures to be followed by the appointed construction contractor to reduced potential nuisance impacts.
CO	Carbon monoxide	A colourless, highly poisonous,odourless, tasteless and flammable gas that is slighted less dense than air.
CL	Critical Load	A quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge
DCLG	Department for Communities and Local Government	A former government department (now the Ministry of Housing, Communities and Local Government).
DCO	Development Consent Order	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
DEFRA	Department for Environment, Food and Rural Affairs	The Government department responsible for policy and regulations on environmental, food and rural issues. The department's priorities are to ground the rural economy, improve the environment and safeguard animal and plant health.

Acronym	Term	Meaning
DMP	Dust Management Plan	A Dust Management Plan manages dust emissions generated within the project area, so that the appropriate dust criteria is met during both the construction and operational stages of the project
DMRB	Design Manual for Roads and Bridges	The Design Manual for Roads and Bridges contains information about current standards relating to the design, assessment and operation of motorway and all-purpose trunk roads in the United Kingdom.
EIA	Environmental Impact Assessment	The statutory process by which information about environmental effect is collected, assessed and used to inform decision making.
EPA	Environmental Protection Act	The Environmental Protection Act 1990 is an Act of the Parliament of the United Kingdom that as of 2008 defines, within England and Wales and Scotland, the fundamental structure and authority for waste management and control of emissions into the environment.
EPUK	Environmental Protection UK	Environmental Protection UK is a national charity that provides expert policy analysis and advice on air quality, land quality, waste and noise.
ES	Environmental Statement	A statutory document which reports the EIA process produced in accordance with the EIA Directive as transposed into UK law by EIA Regulations.
EU	European Union	An economic and political union of 28 countries which operations an internal (or single) market which allows the free movement of goods, capital, services and people between member states.
EULV	EU Limit Value	The Environmental Protection Act 1990 (initialism: EPA) is an Act of the Parliament of the United Kingdom that as of 2008 defines, within England and Wales and Scotland, the fundamental structure and authority for waste management and control of emissions into the environment.
HCs	Hydrocarbons	Hydrocarbons, an organic compound consisting entirely of hydrogen and carbon, and a by-product of fossil fuel combustion
HDV	Heavy Duty Vehicle	Any vehicle with a weight greater than 3.5 tonnes
HGV	Heavy Good Vehicle	Any truck with a weight greater than 3.5 tonnes
HIT	Humber International Terminal	A terminal located within the Port of Immingham.

Acronym	Term	Meaning
IAQM	Institute of Air Quality Management	The professional body for air quality practitioners.
LAQM	Local Air Quality Management	A key part in the UK Government's and the Devolved Administrations' strategies to achieve the air quality objectives.
LDF	Local Development Framework	Local Plans are used to help decide on planning applications and other planning related decisions
LDV	Light Duty Vehicle	Any vehicle with a weight less than 3.5 tonnes
LNG	Liquefied Natural Gas	Liquefied Natural Gas is natural gas that has been cooled to a liquid state (liquefied), for shipping and storage.
MARPOL	The International Convention for the Prevention of Pollution from Ships	The main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes.
MGO	Marine Gas Oil	Marine gasoil (MGO) describes marine fuels that consist exclusively of distillates. Distillates are all those components of crude oil that evaporate in fractional distillation and are then condensed from the gas phase into liquid fractions. Marine gasoil usually consists of a blend of various distillates.
MHCLG	Ministry of Housing, Communities and Local Government	The Ministry of Housing, Communities and Local Government's (formerly the Department for Communities and Local Government).
MPS	Marine Policy Statement	The UK Marine Policy Statement provides the framework for preparing Marine Plans and is key when making decisions directly affecting the marine environment.
NO_2	Nitrogen dioxide	A gas produced when fuels are burned and is often present in motor vehicle and boiler exhaust fumes. It is an irritant to the respiratory system.
NO_X	Oxides of nitrogen	Oxides of nitrogen, a mixture of gases that are composed of nitrogen and oxygen, and a by-product of fossil fuel combustion
NPPF	National Planning Policy Framework	A planning framework which sets out the Government's planning policies for England and how these are expected to be applied.
NPSfP	National Policy Statement for Ports	The National Policy Statement fo Ports provides the framework for decisions on proposals for new port development.

Acronym	Term	Meaning
NRMM	Non-Road Mobile Machinery	Any mobile machine, item of transportable industrial equipment, or vehicles which are fitted with an internal combustion engine and are not intended for transporting goods or passengers on roads.
NSIP	Nationally Significant Infrastructure Projects	A type of project listed in the Planning Act 2008, which must be consented by a Development Consent Order.
PEIR	Preliminary Environmental Information Report	The information referred to in Part 1 of Schedule 4 of the EIA Regulations that has been reasonably compiled by the application and is reasonably required to assess the environmental effects of a project.
PINS	Planning Inspectorate	An executive agency with responsibilities for planning appeals, national infrastructure planning applications, local plan examinations and other planning related casework in England and Wales.
PM_{10}	Particulate matter	Particles with an aerodynamic diameter of less than 10 µm, and a by-product of combustion of some fossil fuels
$PM_{2.5}$	Fine particulate matter	Particles with an aerodynamic diameter of less than 2.5 µm, and a by-product of combustion of some fossil fuels
PPG	Planning Practice Guidance	A series of guidance documents which support the content of the National Planning Policy Framework.
SAC	Special Area of Conservation	Sites designated under EU legislation for the protection of habitat and species considered to be of European interest.
SO_2	Sulphur Dioxide	Sulphur dioxide is a colorless, reactive air pollutant with a strong odour.
SPA	Special Protection Area	Sites designated under the European Directive on the Conservation of Wild Birds for the protection of birds in member states.
SSSI	Site of Special Scientific Interest	Areas of land notified by Natural England under section 28 of the Wildlife and Countryside Action 1981 as being of special interest due to its flora, fauna or geological or physiological features.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 7: Noise and Vibration

Associated British Ports

Document History

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Table of contents

Chapter Pages

Tables

7 Noise and Vibration

7.1 Introduction

7.1.1 This chapter presents the preliminary findings of the assessment regarding the likely significant noise and vibration effects of the Project on human Noise Sensitive Receptors (NSRs). The chapter also details the datasets used to inform the assessment, provides an overview of baseline conditions, and sets out how the likely significant effects have been assessed.

7.1.2 There may be interrelationships related to the potential effects on ecological receptors. Therefore, also refer to the following chapters:

a. **Chapter 8: Nature Conservation (Terrestrial Ecology);** and

b. **Chapter 9: Nature Conservation (Marine Ecology)**

7.1.2 This chapter is also supported by the following figures and appendices:

a. **Figure 7.1 Noise Study Area** (PEI Report, Volume III); and

b. **Appendix 7.A Operational Noise Information** (PEI Report, Volume IV).

7.2 Approach to Assessment

Scoping Summary

7.2.1 A scoping exercise was undertaken in August 2022 to establish the form and nature of the noise and vibration assessment, and the approach and methods to be followed.

7.2.2 The Scoping Report (**Appendix 1.A** in PEI Report, Volume IV) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant noise and vibration effects of the Project on NSRs.

7.2.3 Having regard to the information presented within the Scoping Report (**Appendix 1.A** in PEI Report, Volume IV), the Planning Inspectorate (PINS) and the Environment Agency (EA) have responded within its Scoping Opinion (**Appendix 1.B** in PEI Report, Volume IV) with the responses comments as set out in **Table 7.1**. Alongside each Planning Inspectorate comment is a response to how each point is addressed in this chapter.

Table 7.1 Scoping opinion comments on noise and vibration

Consultee	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	The Scoping Report states that given the significant distance (over 450m) from the West Site to residential NSRs represented by NSR2 and NSR3, significant vibration effects are not expected to result from the proposed construction works (or decommissioning works) and seeks to scope out further assessment on these grounds. Given the distance from the DCO site boundary and these receptors, the Inspectorate agrees that this matter can be scoped out of the ES.	Noted - no response required
	The Scoping Report proposes to scope out this matter owing to the large distance to identified sensitive receptors. As noted above, given the distance from the DCO site boundary and these receptors, the Inspectorate agrees that this matter can be scoped out of the ES.	Noted - no response required
	The Scoping Report states that no sources of vibration are expected that could significantly affect buildings, however the assessment would be scoped back in where such sources are identified during the EIA. The Inspectorate agrees that this matter can be scoped out of the ES providing a detailed description of the Proposed Development demonstrates that no significant effects from vibration sources from on-site operations would not have any significant effects.	Noted - no response required

	The Scoping Report refers broadly to “construction activities on-site” but it is not clear whether this includes noise associated with construction vessel movements. Construction vessel noise should be included as a pathway for effects within the assessment.	An assessment of traffic noise on the local highway network is included in this PEI Report. However, given the large distance between residential receptors and the quayside (~1.5km) acknowledged in the second response above, and the nature of the sound of additional vessel movements being part of the established sound character of the area, it is considered unlikely that a significant effect would result and therefore a substantive assessment of sea vessel noise is not required.
Environment Agency	Although written for environmental permitting, guidance entitled Noise and vibration management: environmental permits - GOV.UK (www.gov.uk) is not discussed in this chapter, but will also be useful.	Noted.
North East Lincolnshire Council	The proposed methodology for the assessment of both vibration and noise impact on nearest residential receptors is satisfactory.	Noted.

7.3 Assessment Method

Construction Phase Impacts

7.3.1 To determine the potential temporary noise and vibration impacts that may arise during the construction phase of the Project, the following matters have been considered:

a. Noise and vibration caused by construction site activities; and

b. Noise caused by increases in traffic on existing public road network as a result of construction traffic.

7.3.2 Vibration from traffic on the highway network during the construction phase has been scoped out in line with Design Manual for Roads and Bridges (DMRB) LA111 Noise and Vibration Revision 2 (LA111) (Ref 7-11).

Noise from Construction Sites

7.3.3 The potential noise impacts arising from construction site activities have been assessed using the data and procedures given in BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise' (Ref 7-2).

7.3.4 The assessment involves the calculation of sound emissions from the construction site based on the sound power levels associated with the plant or equipment to be used, and the propagation from sound source to the NSR locations. Sound power levels are taken from manufacturers data and/or archive data given in BS 5228 Part 1. The calculated levels are then compared to nominated criteria to determine whether an adverse impact is expected.

7.3.5 For residential NSRs, the 'ABC' method (detailed in BS 5228 Part 1 Section E.3.2) sets construction noise thresholds for residential NSRs for different time periods (e.g. day, evening, night and weekends) based on the existing ambient noise levels. For the appropriate period (day, evening, night, weekend etc.), the existing ambient noise level is determined and rounded to the nearest 5 dB and the appropriate threshold value is then derived. The predicted construction noise level is then compared with this construction noise threshold value.

7.3.6 The ABC method has then been used as a basis to define criteria that constitutes a potential significant effect at residential receptors. The ABC method is reproduced in **Table 7.2.**

Table 7.2 Construction noise thresholds at residential dwellings

Assessment category and threshold value period	Threshold value $L_{Aeq,T}$ dB – free-field		
	Category A (a)	Category B (b)	Category C (c)
Night-time (23:00 – 07:00)	45	50	55
Evenings and weekends (d)	55	60	65

Assessment category and threshold value period	Threshold value $L_{Aeq,T}$ dB – free-field		
	Category A (a)	Category B (b)	Category C (c)
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
NOTE 1: A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level. NOTE 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise. NOTE 3: Applies to residential receptors only.			
(a) Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. (b) Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as Category A values. (c) Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than Category A values. (d) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays, 07:00 – 23:00 Sundays.			

7.3.7 Based upon the BS 5228 ABC method (Ref 7-2), the criterion adopted in the Environmental Impact Assessment (EIA) (and for this PEIR) for the determination of potentially significant effects is the exceedance of the $L_{Aeq,T}$ threshold level for the category appropriate to the ambient noise level at each NSR. This is considered to be equivalent to the Significant Observed Adverse Effect Level (SOAEL), although as stated in BS 5228, other project-specific factors, such as the number of NSR's affected and the duration and character of the impact, should also be considered by the assessor when determining if there is a potentially significant effect.

7.3.8 For residential receptors and other high sensitivity human receptors, the criterion for the Lowest Observed Adverse Effect Level (LOAEL – see **Table 7.13** for further details) is a predicted construction noise level equal to the existing ambient noise level at each NSR i.e. resulting in a 3 dB increase in noise level when combined with the existing ambient noise level. (Decibels are measured on a logarithmic scale, so noise levels cannot be summed arithmetically. Two sounds of equal level combine to raise the overall sound level by 3 dB).

7.3.9 In accordance with planning policy, significant adverse effects (at or above the SOAEL) should be avoided and other adverse effects (at or above the LOAEL) should be mitigated and minimised, where possible. The assessment focuses on the effects at the nearest existing residential NSRs on Queens Road and the eastern edge of Immingham's main urban residential area to the west.

7.3.10 Based on the above, the magnitude of construction noise impacts on residential receptors has been classified in accordance with the criteria in **Table 7.3**.

Table 7.3 Construction noise magnitude of impact for residential receptors

Magnitude of Impact	Comparison with Threshold Value $L_{Aeq,T}$ dB
High	Exceedance of ABC Threshold Value (the SOAEL) by ≥+5 dB
Medium	Exceedance of ABC Threshold Value (the SOAEL) by up to +5 dB
Low	Equal to or below the ABC Threshold Value (the SOAEL) by up to -5 dB
Very Low	Below the ABC Threshold Value (the SOAEL) by ≥-5 dB

7.3.11 A preliminary quantitative assessment of construction noise has been undertaken to identify potentially significant effects and this has been based upon the available information regarding construction activities and plant requirements. The assessment will be updated as necessary when further details become available and as the construction approach becomes more clearly defined. The updated assessment will be provided in the Environmental Statement (ES).

Noise from construction traffic on existing roads

7.3.12 The noise impacts of construction traffic along existing roads have been assessed with reference to the National Highways document DMRB LA111 (Ref 7-11).

7.3.13 The change in noise level for relevant road links are predicted based on the CRTN (Ref 7-9) Basic Noise Level (BNL) methodology.

7.3.14 The relevant links assessed represent the relevant highway routes that would be taken by Project construction traffic between the Site and the A180. Noise impacts along the construction traffic routes are considered only where there are NSRs along those routes.

7.3.15 BNL predictions have been undertaken for both “with” and “without” construction traffic scenarios for each road link expected to be used by construction vehicles, using currently available daily traffic flows from the transport assessment (**Chapter 11: Traffic and Transport**).

7.3.16 The criteria for the assessment of traffic noise changes arising from construction road traffic are taken from Table 3.17 of DMRB LA111 (Ref 7-11) as reproduced in **Table 7.4**. Magnitude of impact descriptors corresponding to the terminology used in this impact assessment methodology are provided in parenthesis where they differ from DMRB terminology.

Table 7.4 Magnitude of impact at noise sensitive receptors from construction traffic

Magnitude of impact	Change in traffic noise level $L_{A10,18h}$ dB
Major (High)	≥ 5
Moderate (Medium)	3 to <5
Minor (Low)	1 to <3
Negligible (Very Low)	<1

Construction vibration impacts on humans - annoyance

7.3.17 Vibration due to construction activities has the potential to result in adverse impacts at nearby human receptors. The transmission of ground-borne vibration is highly dependent on the nature of the intervening ground between the source and receptor and the activities being undertaken. BS 5228-2: 2009+A1:2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites - Vibration' (Ref 7-2) provides data on measured levels of vibration for various construction works, with particular emphasis on piling. Impacts are considered for both damage to buildings/structures and annoyance to occupiers.

7.3.18 Table E.1 of BS 5228-2 contains a general method for calculation of Peak Particle Velocity (PPV) from percussive piling. This method is designed for use on any percussive piling with limited consideration of ground conditions so risks producing exaggerated worst-case levels. Calculation of PPV vibration levels will be undertaken during the EIA and presented in the ES where percussive piling may be required for construction on the West Site, although at present Continuous Flight Auger (CFA) piling is proposed, which would minimise vibration (and noise) impacts at human receptors.

7.3.19 **Table 7.5** sets out PPV vibration levels and provides a semantic scale for the description of demolition and construction vibration impacts on human receptors, based on guidance contained in BS 5228-2, for reference where assessment of construction vibration impacts on human receptors is required.

Table 7.5 Construction vibration threshold at residential dwellings

Peak Particle Velocity (PPV) level	Description	Magnitude of impact
>= 10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.	High
1.0 to < 10 mm/s	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.	Medium
0.3 to < 1.0 mm/s	Vibration might be just perceptible in residential environments.	Low

Peak Particle Velocity (PPV) level	Description	Magnitude of impact
0.14 to < 0.3 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Very low

7.3.20 For residential receptors, the LOAEL is defined as a PPV of 0.3 mm/s (millimetres per second); this being the point at which construction vibration is likely to become perceptible. The SOAEL is defined as a PPV of 1.0 mm/s, this being the level at which construction vibration can be tolerated with prior warning.

7.3.21 At receptors above the SOAEL, further consideration of whether an effect is significant will be undertaken using professional judgement, taking account of the duration and frequency of the effect, as well as the time of day/ evening/ night that the effect would be experienced.

7.3.22 Given the significant distance from the West Site to residential NSRs represented by NSR3 (see **Table 7.10**) significant vibration effects are not expected to result from the proposed construction (or decommissioning) activities at the Site, as acknowledged in the Scoping Opinion, and therefore further assessment is scoped out.

Construction vibration impacts on buildings and structures

7.3.23 Buildings and structures may be damaged by high levels of vibration. The closest point between the existing NSRs and the proposed development site is <5 m and therefore there is the potential for significant effects depending upon the construction works required in the vicinity of existing buildings.

7.3.24 The principal concern is generally transient vibration, for example due to piling or significant earthworks such as ground compaction.

7.3.25 BS 7385-2: 1993 ‘Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration’ (Ref 7-21) provides guidance on vibration levels likely to result in cosmetic damage and is referenced in BS 5228-2: 2009+A1:2014 (BSI, 2014b). Guide values for transient vibration, above which cosmetic damage could occur, are given in **Table 7.6**.

Table 7.6 Transient vibration guide values for cosmetic damage

Peak Particle Velocity (PPV) level	Description Magnitude of impact	
	4 Hz to 15Hz	15 Hz and Above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	

Peak Particle Velocity (PPV) level	Description Magnitude of impact	
	4 Hz to 15Hz	15 Hz and Above
Unreinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note 1: Values referred to are at the base of the building
Note 2: For un-reinforced or light framed structures and residential or light commercial buildings, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.

7.3.26 BS 7385-2 (Ref 7-21) states that the probability of building damage tends to be zero for transient vibration levels less than 12.5 mm/s PPV. For continuous vibration, such as from vibratory rollers, the threshold is around half this value.

7.3.27 It is also noted that these values refer to the likelihood of cosmetic damage. ISO 4866:2010 (Ref 7-22) defines three different categories of building damage:

- cosmetic – formation of hairline cracks in plaster or drywall surfaces and in mortar joints of brick/concrete block constructions;
- minor – formation of large cracks or loosening and falling of plaster or drywall surfaces or cracks through brick/block; and
- major – damage to structural elements, cracks in support columns, loosening of joints, splaying of masonry cracks.

7.3.28 BS 7385-2:1993 (Ref 7-21) defines that minor damage occurs at a vibration level twice that of cosmetic damage and major damage occurs at a vibration level twice that of minor damage. Therefore, this guidance can be used to define the magnitude of impact identified in **Table 7.7**.

Table 7.7 Magnitude of impact – construction vibration building damage

Magnitude of Impact	Damage Risk	Continuous Vibration Level PPV mm/s
High	Major	30
Medium	Minor	15-<30
Low	Cosmetic	6-<15
Very low	Negligible	<6

7.3.29 These values for construction vibration building damage will be applied within the impacts assessment where activities of a significant producing nature are likely to be required at the development site during construction.

Operational Phase Impacts

7.3.30 To determine the potential noise and vibration impacts that may arise during the operational phase of the Project, the following matters have been considered:

a. Noise from mechanical plant associated with the West Site ammonia dissociation and hydrogen production activities.

b. Noise from traffic movements on the local highways associated with export of liquified hydrogen product.

Noise from operation of the proposed development (on-site sound sources)

7.3.31 Noise emissions from the operation of the proposed development have been predicted using CadnaA® noise modelling software which implements the calculation procedures of ISO 9613 ‘Acoustics – Attenuation of Sound During Propagation Outdoors’, (Ref 7-13) (as appropriate), and based upon information regarding the operating conditions and levels of sound generated by the Main Site mechanical/process plant on-site.

7.3.32 The assessment for this PEI Report has been undertaken using BS 4142 (see below) but a combination of methods, depending upon the applicability of the method relative to the sound source, may be used during the EIA, as set out below.

BS 4142

7.3.33 A preliminary assessment of potential noise impact at nearby NSRs has been undertaken, where applicable, using the guidance in BS 4142:2014+A1:2019 ‘Methods for rating and assessing industrial and commercial sound’ (Ref 7-5).

7.3.34 A key aspect of the BS 4142 (Ref 7-5) assessment procedure is a comparison between the background sound level in the vicinity of residential locations and the rating level of the sound source under consideration. The relevant parameters in this instance are as follows:

- *Background sound level – $L_{A90,T}$ –* defined in the Standard as the *"A-weighted sound pressure level that is exceeded by the residual sound for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels"*;
- *Specific sound level – L_s ($L_{Aeq,Tr}$)* – the "*equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr"*; *and*
- *Rating level – $L_{Ar,Tr}$ –* the *"specific sound level plus any adjustment made for the characteristic features of the sound"*.

7.3.35 BS 4142 (Ref 7-5) allows for corrections to be applied based upon the presence or expected presence of the following:

- *tonality: up to +6 dB penalty* (ranging between a sound that is not tonal and one that is prominently tonal (i.e. containing a discreet frequency/frequency band), at the NSR location);
- *impulsivity: up to +9 dB penalty* (ranging between a sound that has no impulsive character and one that is highly impulsive (i.e. containing short pulses of high frequency components), at the NSR location) (this can be summed with tonality penalty); *and*
- *other sound characteristics (neither tonal nor impulsive but still distinctive): +3 dB penalty.*

7.3.36 Once any adjustments have been made, the background sound level and the rating level are compared. The standard states that:

- *"Typically, the greater the difference, the greater the magnitude of impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

7.3.37 Importantly, as suggested above, BS 4142 (Ref 7-5) requires that the rating level of the noise source under assessment be considered in the context of the environment when defining the overall significance of the impact.

7.3.38 BS 4142 (Ref 7-5) suggests that a one-hour assessment period is considered during the day and a 15-minute assessment period at night.

7.3.39 **Table 7.8** illustrates the magnitude of impact scale to be used in the EIA based upon the numerical level difference. For BS 4142 (Ref 7-5) assessment purposes, the SOAEL is set at a rating level above the background sound level of +10 dB, and the LOAEL at +5 dB, although it should be remembered that the

context assessment (including the absolute level of the sound under consideration) can vary the overall classification of effects.

Table 7.8 Magnitude of impact for industrial sound

Magnitude of impact	BS 4142 descriptor
High	No BS 4142 descriptor for this magnitude level
Medium	Indication of a significant adverse impact, depending upon context
Low	Indication of an adverse impact, depending upon context
Very low	Indication of low effect, depending upon context

IEMA 'Guidelines for Environmental Noise Impact Assessment'

7.3.40 The Institute of Environmental Management and Assessment's (IEMA) 'Guidelines for Environmental Noise Impact Assessment' (Ref 7-12) have been used to undertake a preliminary assessment of the impact of changes in ambient sound level at NSRs due to the operation of the Project, where relevant, to provide additional context regarding the potential operational noise effects of the proposed development with respect to predicted changes in ambient sound levels. On the impact of noise level changes, paragraph 2.7 of the guidelines state –

"For broad band sounds which are very similar in all but magnitude, a change or difference in noise level of 1 dB is just perceptible under laboratory conditions, 3 dB is perceptible under most normal conditions, and a 10 dB increase generally appears to be twice as loud. These broad principles may not apply where the change in noise level is due to the introduction of a noise with different frequency and/or temporal characteristics compared to sounds making up the existing noise climate. In which case, changes of less than 1 dB may be perceptible under some circumstances."

7.3.41 The IEMA Guidelines (Ref 7-12) provide criteria for magnitude of impacts due to noise level changes from a project, as shown in **Table 7.9**, and these have been used within the PEI Report with respect to predicted changes in ambient sound levels.

Table 7.9 Categorising the magnitude of the noise change

Magnitude of Impact	Noise Change, dB
No change	0
Low	0.1 to 2.9
Medium	3 to 4.9
High	>5

Noise from operation of the Project (road traffic noise)

7.3.42 A preliminary assessment of noise from road traffic during the operational phase of the proposed development has been undertaken using guidance provided in DMRB LA 111 (Ref 7-11), as set out earlier under the header “Noise from construction traffic on existing roads.”

Data and information sources

7.3.43 Baseline sound monitoring survey results have been used to characterise the sound climate at the nearest NSRs to the Site boundary. The sound survey data have been supplemented by a desk-based review of other available baseline information. The main desk-based sources of information that have been reviewed to assist in determining the baseline environment within the vicinity of the Site include:

a. Satellite imagery (Google Maps);

b. Ordnance Survey mapping; and

c. UK environmental noise mapping undertaken as per the requirements of the Environmental Noise Directive (END) Directive (Ref 7-10).

7.3.44 The following sources of information have been reviewed and inform the assessment of likely significant effects of noise and vibration generated by the Project:

a. Baseline sound monitoring surveys results;

b. Construction plant and equipment based on data from similar installations;

c. Construction noise data referenced in BS 5228 2009+A1:2014: 'Noise and Vibration Control on Construction and Open Sites – Part 1: Noise’ (Ref 7-2)

d. Proposed site layout plans (**Figure 2.3** in PEI Report, Volume III, for details);

e. Ordnance Survey (OS) mapping and aerial photography of the Project Site and surrounding area;

f. Visit to the area around the Site; and

g. Construction traffic flow data from the transport assessment (see **Chapter 11: Traffic and Transport**).

Determining baseline conditions and noise and vibration sensitive receptors

7.3.45 The location of potential NSRs in proximity to the Site boundary has been considered when assessing the effects associated with noise and vibration levels from the construction, operational (including maintenance) and decommissioning phases of the Project.

7.3.46 Key NSR locations which are considered representative of the nearest and potentially most sensitive existing receptors to the Site have been identified, based upon knowledge of the local area and professional judgement. It is

considered that if noise and vibration levels are suitably controlled at these receptors, then noise and vibration levels will be suitably controlled at other sensitive receptors in the surrounding area, but which are more distant. The NSRs are shown in **Table 7.10** and illustrated on **Figure 7.1** (PEI Report, Volume III). The classification of sensitivity is taken from **Table 7.11**.

Table 7.10 Representative noise sensitive receptors

Description	Sensitivity/ value of receptors	Distance and Direction from DCO site boundary (m)
Residential properties between 1-31 Queens Road. Two representative receptors have been selected as follows: - 31 Queens Road, later referred to as **NSR1** and represents other NSRs at eastern end of row of properties - 1 Queens Road, later referred to as **NSR2** and represents other NSRs at western end of row of properties (Note: not all premises on Queens Road are residential NSRs as these premises also include business uses, which are classified as lower sensitivity – see Table 7.11)	High	Immediately adjacent to western site boundary
Residential properties at Somerton Road, Worsley Road, Dunster Walk, Ings Lane, Oakham Walk, and Kendal Road (eastern extent of Immingham's residential urban area) Properties in this area are later referred to as **NSR3** for the purpose of this PEI Report.	High	460m west of the site boundary
Residential properties at Chestnut Avenue, Waterworks Street and Spring Street (eastern extent of Immingham's residential urban area Properties in this area are grouped together with the above and later referred to as **NSR3** for the purpose of this PEI Report.	High	480m north-west of the site boundary

7.3.47 Noise Important Areas (NIAs) are those areas identified through strategic noise mapping where the top 1% of the population are affected by the highest noise levels in England. The nearest NIA is located in Great Coates on the A1136 around the junction with Aylesby Road. This is approximately 5.6km from the Project Site boundary and beyond the study area over which noise effects are considered likely and noise impacts from the Project at this location are unlikely. No further assessment is therefore required unless this route is later identified as an important construction traffic route during the EIA.

7.3.48 A description of the study areas for ecological receptors are presented in **Chapter 8: Nature Conservation (Terrestrial Ecology)** and **Chapter 9: Nature Conservation (Marine Ecology)** which describes the key noise sensitive ecological receptors and presents a preliminary assessment of noise impacts on those receptors as relevant.

Preliminary baseline sound data collection

7.3.49 In order to help define existing sound conditions at these NSRs, preliminary ambient sound measurements have been undertaken following the requirements of BS 7445 1: 2003 'Description and measurement of environmental noise. Guide to quantities and procedures' (Ref 7-1), in particular regarding instrumentation and monitoring methodology. The sound measurements surveys were undertaken in September 2022 at two representative residential locations in the vicinity of the Project site. The monitoring locations are listed below and presented on **Figure 7.1** (PEI Report, Volume III).

a. **ML1** – outside 31 Queens Road, Immingham (representing NSRs at the eastern end of Queens Road); and

b. **ML2** – on land off Worsley Road (representing NSRs on the eastern edge of Immingham).

7.3.50 The surveys included a minimum of 1-hour measurements during the daytime (between the hours 07:00 to 23:00) and 30-minutes during the night-time (between the hours of 23:00 to 07:00). Each sound level meter was set to log the L_{AF10}, L_{Aeq}, L_{AF90} and L_{AFmax} parameters.

7.3.51 All measurements were taken at approximately 1.5m above ground level and were positioned at least 3.5m from any reflecting surface, other than the ground (i.e. free-field). All measurements were attended and details of ongoing activities and noise sources in the area recorded.

7.3.52 The weather conditions during the survey periods were all within the parameters set out in the relevant guidance documents including BS 7445 (Ref 7-1) and BS 5228-1 (Ref 7-2).

7.3.53 The sound level meters and associated microphones were field calibrated at the beginning and end of their respective measurement periods in accordance with recommended practice. No significant drift in calibration was observed. The accuracy of the calibrator can be traced to the National Physical Laboratory Standards.

7.3.54 In addition to the preliminary baseline surveys undertaken in September 2022 for the Project, baseline data collected during 2021-22 for The Applicant's separate 'Immingham Eastern Ro-Ro Terminal' ('IERRT') project (on port land to the east and north of the Project site) and for the 2013 Brocklesby Estate 'Kings Road Industrial Development' application (to develop the proposed Project West Site) have also been referenced as below and assigned monitoring location IDs specific to this Project:

a. **I_ML3 –** opposite Queens Road Café, Queens Road, Immingham (taken from location M2 in IERRT Environmental Statement) (representing the western end of Queens Road NSRs);

b. **K_ML4* –** adjacent to the West Site south of 31 Queens Road (taken from location 1 in Kings Road Industrial Development Environmental Statement) (representing eastern end of Queens Road NSRs);
K_ML5* – adjacent to the West Site west of 1 Queens Road (taken from location 2 in Kings Road Industrial Development Environmental Statement) (representing western end of Queens Road NSRs);

c. **K_ML6* –** end of Waterworks Street to the northwest of West Site (taken from location 3 in Kings Road Industrial Development Environmental Statement); and

d. **K_ML7* –** off Somerton Road to the west of the West Site (taken from location 4 in Kings Road Industrial Development Environmental Statement).

***** this baseline data from 2013 has been referenced to provide context, or where applicable, to present a conservative approach to defining baseline.

Defining Significance of Effect

Sensitivity / value of receptors

7.3.55 Noise and vibration effects are classified based on the relevant magnitude of the impact (as outlined above for the various potential impacts during construction and operation) and the sensitivity or value of the affected receptor. The scale of receptor sensitivity presented in **Table 7.11** is based on professional judgement and classifications adopted for other recent EIAs for Development Consent Order (DCO) applications.

Table 7.11 Sensitivity / value of receptors

Sensitivity/ Value of Resource/ Receptor	Description	Example of Receptor Usage
Very high	Receptors where noise or vibration will significantly affect the function of a receptor	• Auditoria / studios • Specialist medical/ teaching centres, or laboratories with highly sensitive equipment
High	Receptors where people or operations are particularly susceptible to noise or vibration	• Residential • Quiet outdoor areas used for recreation • Conference facilities • Schools/ educational facilities in the daytime • Hospitals/ residential care homes • Libraries

Sensitivity/ Value of Resource/ Receptor	Description	Example of Receptor Usage
Medium	Receptors moderately sensitive to noise or vibration where it may cause some distraction or disturbance	• Offices • Restaurants/ retail • Sports grounds when spectator or noise is not a normal part of the event and where quiet conditions are necessary (e.g. tennis, golf)
Low	Receptors where distraction or disturbance of people from noise or vibration is minimal	• Residences and other buildings not occupied during working hours • Factories and working environments with existing high noise levels • Sports grounds when spectator or noise is a normal part of the event

Classification of effects

7.3.56 Impacts are defined as changes arising from the Project, and consideration of the result of these impacts on environmental receptors enables the identification of associated effects, and their classification (major, moderate, minor and negligible, and adverse, neutral or beneficial). Each effect has been classified both before and after mitigation measures have been applied.

7.3.57 The following terminology has been used in the assessment to define effects:

a. adverse – detrimental or negative effects to an environmental resource or receptor;

b. neutral – effects to an environmental resource or receptor that are neither adverse nor beneficial; or

c. beneficial – advantageous or positive effect to an environmental resource or receptor.

7.3.58 The effect resulting from each individual potential impact type detailed above has been classified according to the relevant magnitude of the impact and the sensitivity or value of the affected receptor using the matrix presented in **Table 7.12**. Where necessary the context of the acoustic environment has also been considered in determining the classification of effect.

Table 7.12 Classification of effects

Sensitivity/ Value of Resource/ Receptor	Magnitude of Impact			
	High	Medium	Low	Very Low
Very high	Major	Major	Moderate	Minor

Sensitivity/ Value of Resource/ Receptor	Magnitude of Impact			
	High	Medium	Low	Very Low
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Minor	Negligible	Negligible
Low	Minor	Negligible	Negligible	Negligible

7.3.59 Where adverse or beneficial effects are identified, these will be assessed against the following significance scale, derived using the matrix presented in **Table 7.12**:

a. negligible – imperceptible effect of no significant consequence;

b. minor – slight, very short or highly localised effect of no significant consequence;

c. moderate – limited effect (by extent, duration or magnitude), which may be considered significant; or

d. major – considerable effect (by extent, duration or magnitude) of more than local significance or in breach of recognised acceptability, legislation, policy or standards.

7.3.60 For the purposes of this assessment, negligible and minor effects are considered to be not significant, whereas moderate and major effects are considered to be significant. Where necessary the context of the existing acoustic environment has also been taken into account in determining the classification of effect.

7.4 Legislation, Policy and Guidance

7.4.1 **Table 7.13** presents the legislation, policy and guidance relevant to the noise and vibration assessment and details how their requirements will be met during the assessment.

Table 7.13 Relevant legislation, policy and guidance regarding noise and vibration

Legislation / Policy / Guidance	Consideration within the PEI Report
Environmental Noise (England) Regulations 2006 (Ref 7-18)	
The UK Government Environmental Noise (England) Regulations 2006 (as amended 2008, 2009, 2010) were introduced in England to implement European Union, Assessment and Management of Noise Directive 2002/49/EC (known as the END) (The European Parliament and Council of the European Union, 2002). The aims of the END are to define a common approach in order to avoid, prevent or reduce the harmful effects of environmental noise. Under the END, strategic noise mapping of major roads, railways, airports and agglomerations has been completed across England and Round 3 results were published in 2019.	The location of Noise Important Areas (NIA) defined under the END have been identified in **Paragraph 7.3.47** and referenced with respect to assessment of changes in road traffic noise.

Legislation / Policy / Guidance	Consideration within the PEI Report
Environmental Protection Act 1990 (Ref 7-19)	
The Environmental Protection Act 1990 (EPA) Part 3 prescribes noise (and vibration) emitted from premises (including land) so as to be prejudicial to health or a nuisance as a statutory nuisance.	Reference is made in **Section 7.10** to the EPA with respect to operational noise control.
Control of Pollution Act 1974 (Ref 7-6)	
Sections 60 and 61 of Control of Pollution Act 1974 (CoPA) provide the principal legislation regarding demolition and construction site noise and vibration. If noise complaints are received by the local planning authority from local residents, a Section 60 notice may be issued by the local planning authority with instructions to cease work until specific conditions to reduce noise have been adopted. Section 61 of the CoPA 1974 provides a means for applying for prior consent to carry out noise generating activities during construction. Once prior consent has been agreed under Section 61, a Section 60 notice cannot be served provided the agreed conditions are maintained on-site. The CoPA requires that 'Best Practicable Means' (as defined in Section 72 of CoPA) be adopted for construction noise on any given site. CoPA makes reference to BS5228 as Best Practicable Means.	Reference is made **Section 7.10** the CoPA with respect to construction noise control.
Noise Policy Statement for England (NPSE) (Ref 7-7)	
The NPSE (Ref 7-7) seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. The NPSE (Ref 7-7) applies to all forms of noise, including environmental noise, neighbour noise and neighborhood noise. The statement sets out the long-term vision of the government's noise policy, which is to: *"promote good health and a good quality of life through the effective management of noise within the context of policy on sustainable development".* This long-term vision is supported by three aims: • "avoid significant adverse impacts on health and quality of life; • mitigate and minimise adverse impacts on health and quality of life; and • where possible, contribute to the improvements of health and quality of life." The long-term policy vision and aims are designed to enable decisions to be made regarding what is an acceptable noise burden to place on society. The 'Explanatory Note' within the NPSE (Ref 7-7) provides further guidance on defining 'significant adverse effects' and 'adverse effects' using the concepts:	NPSE is considered in **Sections 7.3** and **7.8** with respect to assessing significant adverse and other adverse noise effects and defining LOAELs and SOAELs for the different potential effect types.

Legislation / Policy / Guidance	Consideration within the PEI Report
• No Observed Effect Level (NOEL) - the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established; • Lowest Observable Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and • Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur. The three aims can therefore be interpreted as follows: • the first aim is to avoid noise levels above the SOAEL; • the second aim considers situations where noise levels are between the LOAEL and SOAEL. In such circumstances, all reasonable steps should be taken to mitigate and minimise the effects. However, this does not mean that such adverse effects cannot occur; and • the third aim seeks, where possible, to positively improve the health and quality of life through the pro-active management of noise whilst also taking account of the guiding principles of sustainable development. It is considered that the protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim. The NPSE (Ref 7-7) recognises that it is not possible to have uniform objective noise-based measures that define the SOAEL, LOAEL and NOEL that are applicable to all sources of noise in all situations. The levels are likely to be different for different noise sources, receptors and times of the day.	

Legislation / Policy / Guidance	Consideration within the PEI Report
National Planning Policy - National Policy Statement for Ports (NPSfP) (Ref 7-8)	
The National Policy Statement for Ports (NPSfP) (Ref 7-8) states in paragraph 5.10.4 that "the nature and extent of the noise assessment should be proportionate to the likely noise impact". A staged approach to assessing the operational noise has, therefore, been undertaken. Where potentially significant adverse effects have been identified based upon preliminary higher-level assessment, further, more detailed assessments may be necessary to confirm likely significant adverse effects during the EIA. NPSfP paragraph 5.10.9 also repeats the aims given in the NPSE discussed above. It provides at paragraph 5.10.12 and 5.10.13 that: *"Mitigation measures for the project should be proportionate and reasonable and may include one or more of the following:* • *engineering: reduction of noise at point of generation and containment of noise generated;* • *lay-out: adequate distance between source and noise-sensitive receptors; incorporating good design to minimise noise transmission through screening by natural barriers or other buildings; and* • *administrative: limiting operating times of source; restricting activities allowed on the site; specifying acceptable noise limits; and taking into account seasonality of wildlife in nearby designated sites.* *In certain situations, and only when other forms of mitigation have been exhausted, it may be appropriate for the decision maker to consider requiring noise mitigation through improved sound insulation to dwellings, or in extreme cases, compulsory purchase of affected properties, as a means of consenting otherwise unacceptable development."*	NPSfP is referenced to provide further guidance on the approach to noise assessment, specifically related to port projects, as set out in **Sections 7.3** and **7.8**.
National Planning Policy Framework (NPPF) (Ref 7-15)	
Whilst not the primary policy document for a NSIP Harbour development, the National Planning Policy Framework (NPPF) (Ref 7-15) contains policy on noise and vibration that has relevance to this chapter. It sets out the Government's planning policies for England and how these are expected to be applied. The planning system is required to contribute to and enhance the natural and local environment. Consequently, the aim is to prevent both new and existing development from contributing to or being put at unacceptable risk from being adversely affected by unacceptable levels of noise pollution. The NPPF states in paragraph 185 that planning policies and decisions should: *"Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life"; and*	Consideration is given to NPPF as the overarching framework for mitigating the adverse and significant adverse effects of noise and vibration, and is used in conjunction with NPSE and PPG-N to define the assessment approach as set out in **Sections 7.3** and **7.8**.

Legislation / Policy / Guidance	Consideration within the PEI Report
"identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason".	
Planning Practice Guidance – Noise (Ref 7-14)	
The Planning Practice Guidance for Noise (PPG-N) (Ref 7-14) was first published on 6th March 2014 to provide a web-based resource with more in-depth guidance to the NPPF (Ref 7-14). The PPG aims to make planning guidance more accessible, and to ensure that the guidance is kept up to date. The PPG was last updated for noise in July 2019. The guidance advises that local planning authorities should take account of the acoustic environment and consider: • whether or not a significant adverse effect is occurring or likely to occur; • whether or not an adverse effect is occurring or likely to occur; and • whether or not a good standard of amenity can be achieved. This guidance introduced the additional concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level). The NPSE and PPG recognise that it is not possible to have single objective noise-based measures that define the SOAEL, LOAEL and NOEL that is applicable to all sources of noise in all situations. The levels are likely to be different for different sound sources, receptors and at different times of the day. To determine appropriate LOAEL and SOAEL values in the context of the Project, reference has been made to methodologies and criteria presented in various British Standards and guidance documents. These documents are discussed in the Guidance section of this table below. Factors to be considered in determining if noise is a concern are identified including the absolute noise level of the source, the existing ambient noise climate, time of day, frequency of occurrence, duration, character of the noise and cumulative impacts. With particular regard to mitigating noise impacts on residential development, the guidance highlights that impacts may be partially off-set if residents have access to a relatively quiet façade as part of their dwelling, or a relatively quiet amenity space (private, shared or public).	PPG-N is referenced to provide supplementary guidance to NPPF with respect to mitigation of adverse and significant adverse effects of noise and vibration. As such it is used to define the assessment approach as set out in **Sections 7.3 and 7.8.**
Local Planning Policy - North East Lincolnshire Local Development Plan 2013 to 2032 (adopted 2018) (Ref 7-16)	
The North East Lincolnshire Local Plan (LP) (2013 to 2032) was adopted in 2018 and sets out a strategic vision for the area. The plan is centred around set challenges for NELC and policy which has been implemented to solve them and support local economic sectors. Paragraph 6.38 of the LP states: *"The Borough's economy is heavily reliant on good rail and road freight links, along with sea traffic. The LTP3 outlines a number of freight transport*	Local planning policies are reviewed to ensure the assessment approach set out in **Sections 7.3** and **7.8** incorporates consideration of local authority requirements.

Legislation / Policy / Guidance	Consideration within the PEI Report
related issues, which have a direct bearing on the Borough's economic performance: *1. local access to sites such as ports, affecting their day-to-day operations;* *2. transit routes that affect communities through high levels of HGV traffic and the severance, noise and pollution this can bring;* *3. access to main trunk routes, especially the motorway network;* *4. capacity constraints some distance from the area, such as constraints on the M1, A1 and East Coast Mainline; and,* *5. rail freight capacity in terms of train paths, line speeds and height restrictions."* Policy 5 of the LP states: *" Policy 5 – Development boundaries* *1. Development boundaries are identified on the Policies Map. All development proposals located within or outside of the defined boundaries will be considered with regard to suitability and sustainability, having regard to:* *D. impact upon neighbouring land uses by reason of noise, air quality, disturbance or visual intrusion"*	
Local Planning Policy - North Lincolnshire Council Planning for Health and Wellbeing- Supplementary Planning Document (November 2016) (Ref 7-17)	
The NELC Planning for Health and Wellbeing- Supplementary planning document was adopted in July 2016, it builds on policies in the Core Strategy and North Lincolnshire Local Plan and sets out our planning policy towards Health and Wellbeing and is used to make decisions on planning applications. Policy 3 – Well designed places states that when considering the detail of development, proposals should: *"Seek to reduce noise and air pollution through ensuring planning applications include a Noise Impact Assessment and Air Quality Assessment in areas of concern."* Paragraph 4.15 states "the design of places also needs to take account of transport which has a direct impact on health and safety. Air pollution, noise, traffic and congestion all have a negative impact on people's ability to enjoy their environment."	Local planning policies are reviewed to ensure the assessment approach set out in **Sections 7.3** and **7.8** incorporates consideration of local authority requirements.

Stakeholder Engagement

7.4.2 A range of stakeholders have been engaged as part of the scoping process to obtain their views on the Project and the scope of the noise and vibration assessment, the results of which are presented within the Scoping Opinion (**Appendix 1.B** of the PEI Report, Volume IV) and summarised in **Table 7.1** .

7.4.3 Further consultation will be undertaken with North East Lincolnshire Council (NELC) Environmental Health Department as part of the EIA and documented in the ES.

Limitations and Assumptions

7.4.4 This preliminary assessment reflects the data obtained and evaluated at the time of reporting and is based on an emerging design for the Project and the maximum likely extents of land required for its construction and operation and subsequent demolition (of the hydrogen production facilities alone).

7.4.5 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further through the assessment and consultation processes, and as further research and investigative surveys are completed.

7.4.6 Detailed information about the construction methods and plant requirements is not yet available and therefore the construction noise assessment, whilst quantitative, is regarded as indicative as it has been based primarily on construction plant which is likely to be used and professional judgement.

7.4.7 Detailed traffic predictions for the operational phase of the development are not yet available. However, as stated in **Chapter 2: The Project** the hydrogen production facility is expected to generate up to 98 daily HGV movements (49 inbound, 49 outbound) and these movements would take place 24 hours a day. Any additional HGV movements associated with the operational jetty alone are likely to be a small fraction of this. An initial qualitative appraisal of potential impacts is provided here and will be updated in the ES.

7.5 Study Area

7.5.1 There is no change to the overall study area set out in the Scoping Report (**Appendix 1.A** of the PEI Report, Volume IV).

7.5.2 The study area covers the spatial extents over which potential direct and indirect airborne noise and vibration effects of the Project may occur during construction, operation and decommissioning at human receptors.

7.5.3 For construction noise on-site, considering NSRs up to 300m of the Project Site boundary is considered to be adequate to capture all significant effects, although additional residential receptors approximately 460m - 500m from the Project Site boundary at the south-eastern edge of Immingham have also been considered for completeness.

7.5.4 For operational noise on-site, the study area extending to NSRs up to approximately 500m from the Project Site boundary has been included, which includes the residential NSRs at the south-eastern edge of Immingham.

7.5.5 For assessment of changes in road traffic noise, NSRs within 50m of the roads which would be used by vehicles associated with construction phase and operational activities define the study area.

7.5.6 The airborne noise and vibration ES chapter will, through further desk-based analysis and assessment, refine the extent of the study area used in this PEI Report where necessary.

7.6 Baseline Conditions

Current Baseline

7.6.1 The typical sources contributing to the baseline sound environment at NSRs along Queens Road (in the vicinity of ML1, I_ML3, K_ML4 and K_ML5, and represented by NSR1 and NSR2 – as detailed in paragraphs 7.3.49 and 7.3.54, and Table 7.10) are road traffic and industrial/commercial/ port activities. More specifically, sound sources comprise road traffic on Queens Road outside the front of the properties, more distant road traffic from the A1173 to the west, industrial/commercial activities from premises to the north side of the Queens Road (Knauf Plant) and more general distant sound from industrial premises including power production, manufacturing, waste, port facilities in the wider area, and occasional distant aircraft.

7.6.2 At NSRs to the west of the Project on the eastern edge of Immingham (in the vicinity of ML2, K_ML6 and K_ML7, and represented by NSR1 and NSR2) sources likely to influence/dominate the baseline sound environment are the road traffic on the A1173 and A180, more distant industrial/commercial premises to the east of the A1173 (associated with power production, manufacturing, waste and port facilities) and occasional distant aircraft.

7.6.3 Descriptions of noise sources observed on site during the measurements for the Project at ML1, ML2 and I_ML3 during the daytime are included in **Table 7.14** and night-time noise sources are included in **Table 7.15**.

Table 7.14 Daytime measurement details

Location	Date	Time of day	Description of sound environment
ML1	04/10/2022	11:46-12:46	Dominated mainly by traffic noise from Queens Road. Other sources comprised a continuous, tonal sound from a factory north of Queens Road and distant traffic.
ML2	04/10/2022	11:30-13:00	Dominated by wind rustle in surrounding scrub. Other sources comprised of distant traffic on A1173, drivebys of vehicles turning around, distant playground noise from nearby schools.
I_ML3	17/11/2022 24/03/2022 25/03/2022 03/03/2022	07.00 – 23.00 (number of visits undertaken to cover the full daytime period)	Dominated by road traffic noise from Queens Road with some contribution from a welding and fabrication workshop in the vicinity. Other sources include a steady industrial hum, and birdsong.

Table 7.15 Night-time measurement details

Location	Date	Time of day	Noise Description
ML1	04/10/2022	01:00-02:00	Dominated mainly by continuous, tonal sound from a factory north of Queens Road. Other sources comprised of traffic passing on Queens Road, the occasional release of steam from the factory in the north, distant industry, distant road noise from A1173 or A180.
ML2	04/10/2022	02:30-03:30	Dominated by wind rustle in surrounding scrub. Other sources comprised of distant road noise from A1173 or A180, unidentified whirring from west.
I_ML3	22/03/2022 23/03/2022	23.00 – 07.00	Dominated by a hum from a building to the northwest, intermittent and irregular high frequency bursts. Contribution from road traffic noise on Queens Road and other local roads.

7.6.4 A summary of the 2021-22 daytime sound levels for ML1, ML2 and I_ML3 are presented in **Table 7.16**.

Table 7.16 Daytime sound levels during survey periods

Measurement Location	Start Time	Duration	Measured sound levels			
			dB $L_{Aeq,T}$	dB $L_{AF90,T}$	dB $L_{AFmax,T}$	dB $L_{AF10,T}$
ML1	11:46	15 min	69	50	92	72
	12:01	15 min	70	49	89	73
	12:16	15 min	69	48	87	73
	12:31	15 min	69	49	88	73
ML2	11:30	15 min	41	48	68	53
	11:45	15 min	50	47	61	52
	12:00	15 min	49	46	58	51
	12:15	15 min	53	46	77	52
	12:30	15 min	51	46	74	53
	12:45	15 min	49	46	62	51
I_ML3	07:12	1 hour	70	46	80	62
	08:12	1 hour	70	51	85	75

Measurement Location	Start Time	Duration	Measured sound levels			
			dB $L_{Aeq,T}$	dB $L_{AF90,T}$	dB $L_{AFmax,T}$	dB $L_{AF10,T}$
	09:12	1 hour	69	51	87	73
	10:12	1 hour	70	51	97	74
	11:12	1 hour	69	49	84	74
	12:09	1 hour	69	47	85	73
	12:41	1 hour	71	51	87	75
	13:09	1 hour	70	48	97	74
	13:41	1 hour	71	53	86	75
	14:09	1 hour	70	48	88	74
	14:41	1 hour	70	52	86	74
	15:09	1 hour	70	47	88	74
	16:24	1 hour	71	50	86	75
	17:24	1 hour	71	45	87	75
	18:23	1 hour	68	45	87	72
	19:23	1 hour	66	44	88	68
	20:23	1 hour	65	44	84	67
	21:00	1 hour	61	46	85	58
	22:00	1 hour	62	46	85	63

All values are in A-weighted dB re 20 µPa, Free-field

7.6.5 A summary of the 2021-22 night-time sound levels for ML1, ML2 and I_ML3 are presented in **Table 7.17**.

Table 7.17 Night-time sound levels during survey periods

Measurement Location	Start Time	Duration	Measured sound levels			
			dB $L_{Aeq,T}$	dB $L_{AF90,T}$	dB $L_{AFmax,T}$	dB $L_{AF10,T}$
ML1	01:00	15 min	58	41	84	47
	01:15	15 min	60	42	87	47

Measurement Location	Start Time	Duration	Measured sound levels			
			dB $L_{Aeq,T}$	dB $L_{AF90,T}$	dB $L_{AFmax,T}$	dB $L_{AF10,T}$
	01:30	15 min	62	42	90	48
	01:45	15 min	54	41	81	45
ML2	02:30	15 min	41	38	51	53
	02:45	15 min	41	37	51	53
	03:00	15 min	40	36	51	53
	03:15	15 min	41	38	51	53
I_ML3	23:00	1 hour	61	46	84	59
	00:00	1 hour	57	46	82	49
	01:00	1 hour	56	46	80	49
	02:00	1 hour	54	45	80	48
	03:00	1 hour	56	45	82	50
	04:00	1 hour	58	45	81	50
	05:00	1 hour	64	46	92	64
	06:00	1 hour	65	46	83	68

All values are in A-weighted dB re 20 µPa, Free-field

Additional Available Baseline Data from 2013

7.6.6 An application for the proposed redevelopment of the site as Kings Road Industrial Development was submitted in 2013 by Brocklesby Estate. An Environmental Statement was prepared by ECUS in support of the application. Baseline surveys were undertaken at four locations as presented on **Figure 7.1** Noise Study Area (PEI Report, Volume III). Further details related to the baseline sound surveys for the Kings Road Industrial Development can be found in the ES Noise and Vibration chapter (Ref 7-23). Sound levels from this ES have been reviewed and comparison of the available preliminary baseline sound level data.

Representative Background Sound Levels

7.6.7 Representative background sound levels have been established for daytime and night-time periods based upon review and comparison of the available preliminary baseline sound level data.

7.6.8 **Table 7.18** summarises the defined *ambient sound levels* and *background sound levels* taken forward within this PEI Report for the NSRs in the vicinity of each noise monitoring location within the BS 4142 assessment. Additional baseline

surveys will be undertaken as the EIA progresses and these values are likely to be updated. Lower values have been used from the available data so as to undertake a conservative assessment.

Table 7.18 Representative daytime ambient (L_{Aeq}) and background (L_{A90}) sound levels

Receptor / Monitoring Location	NSR1 (eastern end of Queens Road) / ML1, K_ML4	NSR2 (western end of Queens Road) / I_ML3, K_ML5	NSR3 (vicinity of Worsley Road & Somerton Road) / ML2, K_ML6, K_ML7
Daytime L_{Aeq} dB (07.00 – 19.00)	52 - 55	58	48
Daytime L_{A90} dB (07.00 – 23.00)	48 - 45	45 - 55	46 - 45
Night-time L_{A90} dB (23.00 – 07.00)	41 - 42	45 - 57	36 - 42

Future Baseline

7.6.9 Much of the Project Site boundary bounds the operational Port of Immingham, which has been in active use for port purposes for a number of decades. The A1173 provides a major route for traffic to and from the A180 to the south and A160 to the northwest. Queens Road provides key access to the eastern side of the Port and other industrial premises to the east and south off the A1173.

7.6.10 In the absence of the Project, the sound environment at NSRs in the vicinity would continue to be influenced/dominated by road traffic noise and port/commercial/industrial activity.

7.6.11 Future Do-Minimum traffic will be reviewed as the EIA progresses to confirm the potential change in future baseline sound levels at NSRs. However, at this PEIR stage, background *sound levels* presented in **Table 7.18** have not been increased to try to predict future levels, as a conservative approach to assessment of The Project.

7.7 Development Design and Impact Avoidance

Construction Phase Noise and Vibration

7.7.1 As described in **Chapter 2: The Project**, core construction working hours would be between 07:00 and 19:00 Monday to Friday and 08:00 and 13:00 Saturdays. However, some activities such as dredging would need to be undertaken on a 24-hour basis and continue until completion for safety or quality reasons. Some construction activities, such as major concrete pours, often take longer than twelve hours and so extended hours may be required. Where on-site construction works are to be conducted outside the core hours, extended hours would be agreed with NELC. Any such works would be minimised and be

carefully managed to reduce effects on local people. Piling will be undertaken within the proposed core working hours, with a minimum 12-hour continuous break in piling within each 24-hour period.

7.7.2 Measures to mitigate noise and vibration would be implemented during the construction phase in order to minimise impacts at local NSRs, particularly with respect to any activities required outside of core working hours. Mitigation to be included in a Construction Environmental Management Plan (CEMP) will include, but not be limited to:

a. Ensuring that processes are in place to minimise noise and vibration before works begin and ensuring that best practical means (BPM) are being achieved throughout the construction programme, including the use of localised screening around the main noise producing plant and activities;

b. All contractors will be familiar with current legislation and the guidance in BS 5228 (Parts 1 and 2) (Ref 7-2; Ref 7-3), which will be a prerequisite of their appointment;

c. Ensuring that modern plant is used, complying with applicable UK noise emission requirements, and selection of inherently quiet plant where possible;

d. All pneumatic percussive tools will be provided with effective silencers / acoustic covers;

e. Acoustic covers to engines will be kept closed when the engines are in use and idling;

f. Hydraulic techniques for breaking to be used, where practical, in preference to percussive techniques where reasonably practicable;

g. Use of lower noise and vibration piling (e.g. rotary bored or hydraulic jacking) rather than driven piling techniques, where reasonably practicable;

h. No start-up or shut down of vibratory rollers near to receptors;

i. Off-site pre-fabrication for components of the Project, where reasonably practicable;

j. All plant and equipment being used for the works to be properly maintained, silenced where appropriate, operated to prevent excessive noise and vibration and switched off when not in use;

k. Machines such as cranes that may be in intermittent use will be shut down between work periods or should be throttled down to a minimum. Machines will not be left running unnecessarily;

l. Where reasonably practicable, the contractor will use quieter working methods, the most suitable plant and, reasonable hours of working for noisy operations;

m. Where possible, the items of plant will be located the furthest distance from the nearby NSRs. Plant known to emit noise strongly in one direction will, when possible, be orientated so that the noise is directed away from NSRs;

n. Loading and unloading of vehicles, dismantling of site equipment such as scaffolding or moving equipment or materials within the Project Site to be

conducted in such a manner as to minimise noise and vibration generation, as far as reasonably practicable;

o. No employees, subcontractors and persons employed on the site will cause unnecessary noise from their activities e.g. excessive 'revving' of vehicle engines, shouting and general behaviour etc. No radios or other audio equipment will be allowed on site;

p. When operating plant, the use of noise-control equipment such as jackets on pneumatic drills, acoustic covers on compressors, shrouds on piling rigs and cranes will be implemented;

q. Electrically powered plant will be used over diesel power generators where possible and feasible;

r. Audible warning systems (including reversing alarms) will be switched to the minimum setting required by the Health and Safety Executive;

s. The use of any tannoy system on site will be used for emergency use only;

t. All contractor communication devices will be used at a minimum audible level;

u. Appropriate routing of construction traffic on public roads and along access tracks, to reduce construction traffic noise, as far as reasonably practicable (see **Chapter 11: Traffic and Transport**);

v. Provision of information to NELC and local residents to advise of potential noisy works that are due to take place; and

w. Monitoring of noise and vibration complaints and reporting to the Applicant for immediate investigation.

7.7.3 Method statements regarding construction management, traffic management, and overall site management will be prepared in accordance with best practice and relevant British Standards, to help to reduce impacts of construction works. One of the key aims of such method statements will be to minimise noise and vibration disruption to local residents during the construction phase as far as reasonably practicable.

7.7.4 Regular communication with the local community throughout the construction period will also serve to publicise the works schedule, giving notification to residents regarding periods when higher levels of noise and vibration may occur during specific operations, and providing lines of communication where complaints can be addressed.

7.7.5 The selected contractor would be encouraged to be a member of the 'Considerate Constructors Scheme', which is an initiative open to all contractors undertaking building work.

7.7.6 A CEMP will be prepared which will include setting out provisions to ensure that the noise and vibration impacts relating to construction activities are reduced, as far as reasonably practicable, based on the measures outlined above. An Outline CEMP will accompany the DCO Application.

7.7.7 The timing details of decommissioning of the hydrogen production facilities are uncertain at this time. However, the mitigation measures set out in this Section

for construction noise and vibration will also be appropriate mitigation during the decommissioning stage.

7.7.8 The control and monitoring of noise and vibration during construction and decommissioning is proposed to be secured by a draft Requirement under Schedule 2 of the draft DCO, which will be submitted with the application.

Operational Phase Noise and Vibration

7.7.9 During the detailed design stage, any significant noise effects will be mitigated by plant location, site layout and design. This may include use of enhanced building cladding, and use of acoustic enclosures and screening where appropriate and, where practical siting of equipment away from site boundaries and NSRs.

7.7.10 It is anticipated that the control and monitoring of noise during operation would be secured by a draft Requirement under Schedule 2 of the draft DCO.

7.7.11 The Site will be operated in accordance with an Environmental Permit, issued and regulated by the Environment Agency. This will require operational noise from the generating station to be controlled through the use of Best Available Techniques (BAT), which will be determined through the Environmental Permit application.

Decommissioning Phase Noise and Vibration

7.7.12 Appropriate best practice mitigation measures will be applied during decommissioning works for the hydrogen production facility and documented in a Decommissioning Environmental Management Plan (DEMP) to control noise effects. This is proposed to be secured by a Requirement in the draft DCO. No additional mitigation for decommissioning of the Project beyond such best practice is considered necessary at this stage. The exact approach would be determined by the legislative requirements that are required at that point in time.

7.8 Potential Impacts and Effects

7.8.1 This section contains a preliminary assessment of the impacts and effects on NSRs as a result of the construction, operational and decommissioning phases of the Project. The main focus of the assessment is on the landside operations for the hydrogen production facilities on the West Site. This is the part of the Project closest in proximity to the residential NSRs at Queens Road and the residential areas at the eastern edge of Immingham to the west and is also most likely to be impacted by the Project related road traffic.

7.8.2 The following impact pathways have therefore been assessed:

a. Potential noise and vibration impacts associated with activities on-site, during construction;

b. Potential noise impacts associated with traffic movements on local highways, during construction;

c. Potential noise impacts from mechanical plant associated with the West Site ammonia dissociation and hydrogen production activities, during operation;

d. Potential noise impacts associated with traffic movements on the local highways associated with export of liquified hydrogen product, during operation.

e. Potential noise and vibration impacts associated with activities on-site, during decommissioning of the hydrogen production facilities; and

f. Potential noise impacts associated with traffic movements on the local highways, during decommissioning of the hydrogen production facilities.

Construction Phase

7.8.3 Detailed construction information and a detailed programme is not yet available. However, likely construction activities and the typical plant likely to be used during construction works have been considered based upon preliminary information and using professional judgement.

7.8.4 The landside construction works have been broadly categorised into:

a. Site clearance;

b. Piling and foundations;

c. Underground drainage and services;

d. Roads and hardstanding; and

e. Buildings and plant installation.

7.8.5 Typical plant for the landside works in the West Site are likely to include:

a. Cranes

b. Telehandlers

c. Diesel generators

d. Hydraulic excavators

e. Dump trucks

f. Wheeled/front loaders

g. Tippers

h. Rollers

i. Asphalt/concrete plant

j. Concrete mixers and pumps

k. Compressors

l. Continuous flight auger piling rig

7.8.6 It is envisaged that the construction works for the construction of the hydrogen production facility will be based on a six phase construction timeline likely to commence in the second quarter of 2025. Phase 1 is expected to last 3 years. The exact programme and build out of the phases beyond the first Phase will ultimately depend on market demand for the green hydrogen product. Construction of Phases 2 – 6 may take up to eight years if built consecutively.

Further details of the construction phases are presented in **Chapter 2: The Project**.

Construction Noise Limits

7.8.7 Construction noise levels are likely to vary during different construction phases, depending on the location of work sites and proximity to NSRs. The nearest residential NSRs to the DCO Site boundary are on Queens Road (NSRs 1 and 2) and on the eastern edge of Immingham (NSR3). Based on the current ambient available noise levels at monitoring locations in both of these areas and the BS 5228 ABC category guidance in **Table 7.2**, preliminary construction noise limits based upon the lower measured data are:

a. **NSR1 and NSR2** – representative of residential NSRs on Queens Road:
   i 65 dB $L_{Aeq,12hr}$ during daytime
   ii 55 dB $L_{Aeq,8hr}$ during the night-time
b. **NSR3** – residential NSRs in vicinity of Worsley Road/Somerton Road:
   i 65 dB $L_{Aeq,12hr}$ during daytime
   ii 50 dB $L_{Aeq,8hr}$ during the night-time.

7.8.8 Provided these noise limits, or any updated limits based upon additional baseline data collection during the EIA, are not exceeded, the construction noise levels will be below the SOAEL.

Construction noise predictions from on-site works

7.8.9 The noise levels generated by construction activities and experienced by nearby NSRs, such as residential properties, will depend upon a number of variables, the most important of which are:

a. The noise generated by plant or equipment used on site, generally expressed as sound power levels (SWL);
b. The periods of operation of the plant on the site, known as its 'on-time';
c. The distance between the noise source and the receptor;
d. The attenuation due to ground absorption, air absorption and barrier effects; and
e. The existing noise environment and noise levels at the time of the works.

7.8.10 Due to the early stage of project design, indicative predicted construction noise levels reported in this chapter have been undertaken using noise data for items of plant and calculation methodologies from BS 5228-1 and been based on construction methods used for similar projects.

7.8.11 The predictions relate to construction activities being undertaken at the closest process unit to each NSR irrespective of the phase of development i.e. the predicted noise level could occur at some stage during the full six phase build-out. The predictions also assume that where activities could be undertaken concurrently, this is the case and this therefore represents a conservative

approach. This gives an indication of whether, during a potential worst-case scenario, construction noise is at risk of leading to significant adverse effects by comparison with construction noise LOAEL and SOAEL for each residential NSR.

7.8.12 The predicted levels apply to core weekday daytime (07:00 – 19:00) working, although these could also be applied to other time periods where working at the same rate and intensity is proposed. Details regarding the noise prediction methodology, including a full list of indicative construction plant and associated sound power levels (L_w) for each construction phase and assumptions, are presented in **Appendix 7.A** of PEI Report, Volume IV.

7.8.13 A summary of indicative daytime noise level predictions at the NSR locations associated with the West Site construction are presented in **Table 7.19**.

7.8.14 As advised by BS 5228, noise levels predicted at distances over 300m (i.e. at NSR 3 - residential NSRs at the eastern edge of Immingham) should be treated with caution due to the increasing importance of meteorological effects and should represent an overestimate.

Table 7.19 Predicted worst-case daytime construction noise levels - residential NSRs

Activity	Predicted construction noise level $L_{Aeq,T}$ dB (free-field)					
	NSR1 (eastern end of Queens Road)	Magnitude of Impact	NSR2 (western end of Queens Road)	Magnitude of Impact	NSR3 (eastern edge of Immingham)	Magnitude of Impact
Site clearance	83	High	80	High	61	Low
Piling and foundations	79	High	75	High	50	Very Low
Underground drainage and services	70	High	72	High	52	Very Low
Roads and hard standing	82	High	79	High	58	Very Low
Buildings and plant installation	72	High	73	High	53	Very Low
All values are in A-weighted dB re 20 µPa, free-field						

7.8.15 Based on the above, using professional judgement for the West Site construction works, there is the potential for short-term temporary high adverse impacts to arise if significant construction works are undertaken at the closest approach within the Project Site boundary to the nearest NSRs on Queens Road. Based

on the sensitivity of the NSRs (High) as shown in **Table 7.11** of this chapter, this could result in up to **major adverse** effects which are significant. Localised acoustic screening provided by existing commercial premises and the mitigation measures outlined in **Section 7.7** would further assist in minimising construction noise impacts. This will be assessed further in the ES in order to further define any required mitigation measures.

7.8.16 At the NSRs on the eastern edge of Immingham, for example around Worsley Road, Somerton Road and Waterworks Road, due to the much greater separation distance of between 460 – 500m from the Project Site boundary, predicted worst-case construction noise levels would result in short-term temporary low or very low adverse impacts. Based on the sensitivity of the NSRs (High) as shown in **Table 7.11** of this chapter, this could result in up to **minor/negligible adverse** effects which are not significant.

7.8.17 Should construction activities be required outside of the core hours, effects at NSRs may be increased depending upon prevailing representative ambient sound levels during those times and may be significant depending upon the works being undertaken. The proposed construction plant and programme will be reviewed again in preparing the ES and construction noise levels at NSRs will be reassessed.

Construction vibration impacts on humans from on-site activities

7.8.18 The level of impact at different receptors will be dependent upon a number of factors, including distance between the works and receptors, ground conditions, the nature and method of works required close to receptors and the specific activities being undertaken at any given time.

7.8.19 Typically construction works requiring piling or heavy machinery such as vibratory rollers can be associated with potentially significant levels of vibration. Piling is currently expected to be required on the West Site, however, continuous flight auger piling is currently proposed, rather than impact driven piling. As stated in *BS5228* (Ref 7-2) vibration associated with continuous flight auger piling is minimal "*as the processes do not involve rapid acceleration or deceleration of tools in contact with the ground but rely to a large extent on steady motions*"

7.8.20 Road rollers are currently proposed to be used at the West Site, but it is not yet known whether vibratory rollers are required. Should vibratory rollers be required in close proximity of receptors on Queens Road, based upon professional judgement, there is the potential for medium/major adverse impacts (in terms of vibration annoyance to occupants), potentially resulting in effects of **moderate/major adverse** significance (significant). Measures to further mitigate adverse effects are presented in **Section 7.9**.

7.8.21 Due to large distances (minimum of 450m) between residential receptors on the east edge of Immingham and the Site boundary, vibration effects on both humans and buildings would be **negligible.** As with the construction noise, further assessment of construction vibration will be undertaken and presented in the ES. The potential to reduce the magnitude of construction vibration impacts (for example, through the use of low vibration plant) will be presented in the Outline CEMP.

Construction vibration impacts on the Immingham Oil Terminal Pipeline

7.8.22 As detailed in **Chapter 2: The Project**, piling will be required for the marine works (piling design is not yet complete but at this stage it is anticipated that this would likely use vibro/percussive techniques).

7.8.23 The transmission of ground-borne vibration is highly dependent on the nature of the intervening ground between the source and receiver and the activities being undertaken.

7.8.24 Construction effects at the Immingham Oil Terminal Jetty/ Pipeline may be significant, before mitigation, depending upon separation distances. If distances are increased the residual effect would be not significant.

7.8.25 An assessment of likely vibration impacts will be undertaken during the EIA and presented in the ES, based upon empirical formulae and based upon the piling type and parameters proposed at that stage, in order to ensure that significant vibration effects are identified and mitigated as necessary.

Construction noise impacts from sea vessel movements

7.8.26 As detailed in **Chapter 2: The Project**, a small number of sea vessel movements will be required during the construction phase. In particular, the ammonia storage tank are likely to be constructed by transporting large sections to site via sea vessel, before being transported within the Port to the East Site for installation.

7.8.27 However, given the large distance between the nearest residential NSRs on Queens and the quayside (~1.5 km), and the nature of the sound of a small number of additional vessel movements in an area where this source is an established part of the sound character of the area, it is considered unlikely that a additional sea vessel noise would be perceptible and therefore a significant effect is considered unlikely.

7.8.28 Nevertheless, further consideration will be given to this potential pathway during the EIA and the findings presented in the ES, where necessary.

Construction traffic on the local highway network

7.8.29 Preliminary construction traffic data is available and has been used to undertake a preliminary assessment of traffic noise on the NSRs.

7.8.30 It is estimated that Queens Road will experience the greatest percentage increase in traffic flows during construction as traffic reaches the Site. Based upon current two-way baseline flows on Queens Road, between A1173/Kings Road and Queens Road/Laporte Road, future baseline flows on Queens Road in 2025 are forecast to total 4121 per day, of which 601 (15%) will be Heavy Duty Vehicles (HDV).

7.8.31 Construction traffic in 2025 associated with the Project is expected to total 1666 two-way movements per day, of which 194 (12%) will be Heavy Goods Vehicle (HGV) movements per day. This equates to a 40% increase in total flows per day on Queens Road over the predicted future baseline, although the overall the %

HGVs is forecast to reduce compared with baseline flows which will slightly offset some of the increase in noise level.

7.8.32 For context, an increase in traffic flows of 25% would result in a 1 dB(A) increase in road traffic noise and a 100% increase would result in a 3 dB(A) increase, assuming average speeds and the percentage of HGVs remains unchanged. Therefore, on the basis that average traffic speed on Queens Road remains unchanged during construction in 2025, the predicted change in road traffic noise levels at the front façade of properties on Queens Road resulting from a 40% increase in total flow, together with a slightly reduced % HGV component, would be <1.5 dB(A).

7.8.33 This magnitude of noise change would be considered as low in the short-term as detailed in **Table 7.4.**

7.8.34 The extent of the required traffic management is not currently known and therefore it has not been included in this assessment. However, further assessment will be undertaken as the EIA progresses to confirm the predicted noise impacts due to the changes in construction traffic flows and identify if additional and practicable mitigation measures are available.

Operational Phase

Operational sound predictions from on-site plant

7.8.35 The final layout of the Project is yet to be finalised and so noise modelling has been undertaken based upon the indicative locations of operational facilities and equipment associated with the hydrogen production facility on the West Site. However, it is understood that the whilst the layout is not yet finalised, there is relatively limited scope for substantive change in layout of the different 'zones' of plant (e.g. hydrogen production units and liquefiers) around the West Site, due to the necessary process flows. Given this modelling of the project layout without additional noise mitigation it is considered a reasonably representative worst-case.

7.8.36 The operational noise modelling comprises two main scenarios: Phase 1 operation of the associated development, potentially representative of the first three years after opening, and then full operation of Phases 2-6 thereafter.

7.8.37 Further details of the sound source sound power level (Lw) data, the settings used in the noise modelling software and the list of assumptions used are presented in **Appendix 7.B** (PEI Report, Volume IV). Note that the predictions do not currently include tanker filling operations and HGV movements on-site. These will be added to the predictions when further information becomes available as the EIA progresses.

7.8.38 In the absence of additional mitigation, the predicted free-field operational specific sound levels at the NSRs around the Project Site are presented in **Table 7.20**.

Table 7.20 Predicted worst-case operational specific sound levels

Phase	Predicted operational specific sound level $L_{Aeq,Tr}$ dB free-field		
	NSR1 (eastern end of Queens Road)	NSR2 (western end of Queens Road)	NSR3 (eastern edge of Immingham)
Phase 1 Only	56	62	46-50
Phases 1-6 (full operation)	66	65	52-55

7.8.39 The NSRs presented represent the worst affected within the study area. It is anticipated that once constructed, the plant on-site will operate 24/7 and therefore the predicted sound levels could apply to both the 1-hour daytime or 15-minute night-time BS 4142 assessment periods.

BS4142 assessment results

7.8.40 The daytime BS 4142 assessments are presented in **Table 7.21** and the night-time BS 4142 assessments are presented in **Table 7.22**. The magnitude of impact and effect classification has been included in the tables, to provide context for the BS 4142 assessment outcomes, with reference to the semantic scales in **Table 7.9**, **Table 7.10** and **Table 7.11**.

7.8.41 The values presented are the differences between the representative background sound level at each NSR (**Table 7.18**) and the predicted rating level (the specific sound level LAeq,T presented in **Table 7.20** plus the character correction). Positive values in the table indicate an excess of the rating level over the background sound level. The lower of the measured background sound levels from the different source dataset have been taken from **Table 7.18** as a conservative approach. Additional surveys undertaken as the EIA progresses will further inform the representative baseline environment at NSRs.

7.8.42 The assessment has assumed that potential noise of a tonal, impulsive or intermittent nature will be designed out of the Project during the detailed design phase by the selection of appropriate plant, building cladding, louvres and silencers/ attenuators as necessary. However, inclusion of a +3 dB correction for other distinctive character has been included at this stage as a conservative approach for NSR with the potential to identify the new sound source in their existing acoustic environment.

Table 7.21 Daytime BS4142 assessment (without additional specific mitigation)

Receptor	Phase 1 only			Phase 1-6 (full operation)		
	NSR1 (eastern end of Queens Road)	NSR2 (western end of Queens Road)	NSR3 (eastern edge of Immingham)	NSR1 (eastern end of Queens Road)	NSR2 (western end of Queens Road)	NSR3 (eastern edge of Immingham)
Specific sound level L_s ($L_{Aeq,Tr}$), dB	56	62	46 – 50	66	65	52 – 55
Acoustic feature correction, dB	+3	+3	+3	+3	+3	+3
Rating level ($L_{Ar,Tr}$), dB	59	65	49 – 53	69	68	55 – 59
Representative *background sound level* ($L_{A90,T}$), dB	45	45	45	45	45	45
Excess of *rating level* over *background sound level* ($L_{Ar,Tr}$ - $L_{A90,T}$), dB	+14	+20	+4 – +8	+24	+23	+10 – +14
Magnitude of impact (assigned from Table 9.12)	High	High	Low / Low-Medium	High	High	Medium / High
Initial BS 4142 classification of effect (assigned from Table 9.14)	Major adverse	Major adverse	Minor / Minor-Moderate adverse	Major adverse	Major adverse	Moderate / Major adverse
Uncertainty: Given the use of sound level data from a number of sources, and the variance in some of the sound level values, significantly different 'representative' *background* and *ambient sound level* values could be obtained using additional baseline data, particularly long-term, allowing the use of different statistical analysis methods.						

Table 7.22 Night-time BS4142 assessment (without additional specific mitigation)

Receptor	Phase 1 only			Phase 1-6 (full operation)		
	NSR1 (eastern end of Queens Road)	NSR2 (western end of Queens Road)	NSR3 (eastern edge of Immingham)	NSR1 (eastern end of Queens Road)	NSR2 (western end of Queens Road)	NSR3 (eastern edge of Immingham)
Specific sound level L_s ($L_{Aeq,Tr}$), dB	56	62	46 – 50	66	65	52 – 55
Acoustic feature correction, dB	+3	+3	+3	+3	+3	+3
Rating level ($L_{Ar,Tr}$), dB	59	65	49 – 53	69	68	55 – 59
Representative *background sound level* ($L_{A90,T}$), dB	41	45	36	41	45	36
Excess of *rating level* over *background sound level* ($L_{Ar,Tr}$ - $L_{A90,T}$), dB	+18	+20	+13 – +17	+28	+23	+19 – +23
Magnitude of impact (assigned from Table 9.12)	High	High	Medium-High / High	High	High	High
Initial BS 4142 classification of effect (assigned from Table 9.14)	Major adverse	Major adverse	Moderate-Major / Major adverse	Major adverse	Major adverse	Major adverse
Uncertainty: Given the use of sound level data from a number of sources, and the variance in some of the sound level values, significantly different 'representative' *background* and *ambient sound level* values could be obtained using additional baseline data, particularly long-term, allowing the use of different statistical analysis methods.						

7.8.43 In accordance with **Table 7.9**, the values presented in **Table 7.21** and **Table 7.22** produce a range of impact magnitudes resulting in effects ranging between minor adverse (not significant, and below the LOAEL) to major adverse (significant, and at or above the SOAEL), subject to consideration of context as below.

Consideration of context

7.8.44 The Project Site is adjacent to the operational area of the Port of Immingham, one of the busiest ports in the UK, operating 24 hours a day, 365 days a year. The area surrounding the Port is also primarily industrial in nature, being dominated by chemical manufacturing, oil processing and power generation facilities. Beyond the industrial facilities, the wider area is largely agricultural.

7.8.45 The landside elements of the Project will replace some temporary storage activities currently operating on parts of the Project site and also use areas zoned for future light industrial use. This, as well as the existing operational port traffic using Queens Road, Laporte Road and other nearby access routes is likely to mean that many residents in the local communities are already accustomed to an industrial sound environment. The Project will be somewhat similar to existing port uses and will generate additional off-site movements, most notably along Queens Road.

7.8.46 **Table 7.23** presents existing and future predicted ambient sound levels (assuming constant operation of the Project) and compares them to the BS8233:2014 and WHO 'Guidelines for Community Noise' recommended indoor ambient sound level for sleeping. The recommended internal criterion is 30 dB $L_{Aeq,8h}$, which would be equivalent to an external criteria of 45 dB $L_{Aeq,8h}$ assuming open bedroom windows for ventilation. The predicted change in ambient sound levels can also be contextualised in accordance with **Table 7.9**.

Table 7.23 Comparison of ambient sound levels without additional mitigation

Receptor	Time Period	Existing *ambient sound level* $L_{Aeq,T}$, dB ^	Predicted *specific sound level*, $L_{Aeq,Tr}$, dB	Sum of existing *ambient sound level* and predicted *specific sound level* $L_{Aeq,Tr}$, dB	Predicted increase in existing *ambient sound level* due to the proposed development, $L_{Aeq,Tr}$, dB
NSR1 (eastern end of Queens Road)	Daytime (16 hour)	52*	66	66	+14
	Night-time (8 hour)	50*	66	66	+16
NSR2 (western end of Queens Road)	Daytime (16 hour)	58*	65	66	+8
	Night-time (8 hour)	60**	65	66	+6

Receptor	Time Period	Existing *ambient sound level* $L_{Aeq,T}$, dB ^	Predicted *specific sound level*, $L_{Aeq,Tr}$, dB	Sum of existing *ambient sound level* and predicted *specific sound level* $L_{Aeq,Tr}$, dB	Predicted increase in existing *ambient sound level* due to the proposed development, $L_{Aeq,Tr}$, dB
NSR3 (eastern edge of Immingham)	Daytime (16 hour)	48*	52-55	53-56	+5 – +8
	Night-time (8 hour)	41***	52-55	52-55	+11 – +14
^ Note, additional baseline surveys will be undertaken as the EIA progresses and therefore these values are subject to update. Lower values have been used from the available data as a conservative approach. * Taken from Kings Road Industrial Development ES Chapter ** Taken from Kings Road Industrial Development ES Chapter and baseline surveys for this Project *** Taken from baseline surveys for this Project					

7.8.47 As shown in **Table 7.23**, ambient sound levels increase due to the predicted levels from the Project, and all are above the BS8233:2014/WHO external criterion of 45 dB $L_{Aeq,8h}$. The predicted levels of increase in ambient sound level would be classified as high in accordance with Table 7.**9**.

7.5.2 On this basis of the above BS 4142 assessment, and that there is likely to be a desire to reduce noise levels to the LOAEL (no greater than +5 dB excess of rating level over background sound level) or lower, potential options to reduce noise levels are discussed in **Section 7.9** (Mitigation and Enhancement Measures).

Operational Road Traffic

7.8.48 Detailed traffic predictions for the operational phase of the development are not yet available. However, as stated in **Chapter 2: The Project** the hydrogen production facility is expected to generate up to 98 daily HGV movements (49 inbound, 49 outbound) and these movements would take place 24 hours a day. Any additional HGV movements associated with the operational jetty alone are likely to be a small fraction of this. Project related daily flows are therefore considered likely to be considerably lower than during construction.

7.8.49 On this basis, the magnitude of road traffic noise change at NSRs fronting onto Queens Road would likely be very low in the short-term, based upon **Table 7.4**, with corresponding negligible adverse significance of effect (not significant).

7.8.50 However, further assessment of operational traffic noise impacts will be undertaken during the EIA and presented in the ES as traffic flows are finalised.

Decommissioning of the hydrogen production facilities

7.8.51 The potential for adverse noise effects would require further consideration at the decommissioning stage of the Project, but potential measures to ensure that

appropriate mitigation is in place during such works are detailed in **Section 7.7**. The effects of eventual decommissioning the hydrogen production facilities are considered to be comparable to, or less than, those assessed for construction activities.

7.8.52 Decommissioning would require submission of a Decommissioning Environmental Management Plan (DEMP) to NELC for its approval, secured by a Requirement of the draft DCO. Appropriate best practice mitigation measures will be applied during any decommissioning works, as described in **Section 7.7**, and documented in a DEMP; no additional mitigation for decommissioning of the Proposed Development beyond such best practice specified in BS 5228 and **Section 7.7** mitigation is considered necessary to specify at this stage.

7.9 Mitigation and Enhancement Measures

7.9.1 The following mitigation measures are being considered as part of the design development of the Project for both the construction and operational phases:

a. Applying the noise hierarchy;

b. Selecting where possible lower noise generating equipment;

c. Limits on noise emissions from plant and equipment at source;

d. Layout design to optimise noise attenuation;

e. Enclosures and buildings for compressors and other equipment, silencers for vents and acoustic insulation on pipework to the extent technically and economically feasible;

f. Planning plant operating modes to minimise start up, shut down and venting;

g. Maintenance activities will be carried out with due consideration to eliminate or minimise noise;

h. Acoustic barriers/screens or earth bunds to reduce transmission of noise from the western site;

i. Specific training for plant personnel and contractors;

j. In the operational phase, as part of the EPR permit, its required to demonstrate to the regulator (Environment Agency) the use of relevant the Best Available Techniques to prevent, minimise or mitigate noise as part of an Operational Noise Management Plan (ONMP); and

k. Recommendation for provision of a package of sound insulation to nearby NSRs, as a last resort, where other applied measures are unlikely to be adequate.

7.9.2 Further consideration will be given to the above during the EIA and presented in the ES.

Construction Phase

7.9.3 Based upon the current assessment, noise effects of up to major adverse (significant, and above the SOAEL) are predicted at Queens Road (represented by NSR1 and NSR2) during on-site weekday daytime and Saturday morning works. Similar effects would be expected if works were to take place at the same

intensity during evenings/ night-time and/ or other weekend periods. Potentially significant adverse effects are also predicted as a result of construction traffic passing residential NSRs on Queens Road as the worst-case estimate.

7.9.4 The preferred approach for controlling construction noise and vibration is to reduce levels at source, where reasonably practicable. Sometimes a greater noise or vibration level may be acceptable if the overall construction time, and therefore length of disruption, is reduced.

7.9.5 The list of noise control measures presented within **Section 7.7** of this chapter provides a detailed but not exhaustive list of construction noise and vibration management measures that may be implemented, supplemented as necessary with further bespoke measures identified through further detailed assessment as part of the EIA and the CEMP.

7.9.6 The need for monitoring of noise and vibration levels during construction will also be determined through the detailed assessment undertaken.

7.9.7 Residual effects after mitigation are described in **Section 7.10**.

Operational sound from on-site plant

7.9.8 Based upon the current assessment, major adverse noise effects (significant) are predicted during daytime and night-time at Queens Road NSRs (NSR1 and NSR2).

7.9.9 At NSRs on the eastern edge of Immingham to the west (NSR23), predicted effects range between minor/moderate adverse (potentially significant, with some NSRs being at or above the LOAEL and approaching the SOAEL) to major adverse (significant, and above the SOAEL) depending upon time period and phase of Project buildout.

7.9.10 The operational assessment has assumed that potential sound of a tonal, impulsive or intermittent nature (according to BS4142: 2014) will be designed out of the Project during the detailed design phase through the selection of appropriate plant, building cladding, louvres and silencers/ attenuators as necessary. However, a +3 dB correction for distinctive character has been applied to the *specific sound levels* predicted from the Project, for NSR with the potential to identify the new sound source in their existing acoustic environment.

7.9.11 The sound reductions required to mitigate operational sound will be considered further as the Project design progresses and presented in the ES, with the overall aim of achieving the daytime and night-time LOAEL criterion of a *rating level* no greater than +5 dB above the defined representative *background sound level* at each NSR. This is likely to be achievable at NSRs at the eastern edge of Immingham (NSR3), for example by using acoustic barriers/screens or earth bunds on the edge of the West Site to reduce transmission of noise.

Operational Road Traffic Noise

7.9.12 This preliminary assessment identifies that due to relatively low numbers of vehicles associated with operation of the Project, for significant adverse effects at residential NSRs along Queens Road are not expected.

7.10 Preliminary Assessment of Residual Effects

Construction

7.10.1 Based on the implementation of the impact avoidance measures, and following implementation of additional noise specific measures (including further assessment work to be undertaken and presented in the ES), which will help minimise the risk of noise complaints and potential enforcement action under the CoPA by NELC, this preliminary assessment concludes that residual construction noise effects at residential NSRs on Queens Road (represented by NSR1 and NSR2) may be of moderate adverse significance (significant) from both on-site works and off-site traffic. However, as explained in **Table 22.2** of **Chapter 22: Major Accidents and Disasters**, further assessment is required of the consequences of the operation of the hydrogen production facility on surrounding land uses in terms of major hazard planning. It is currently anticipated that the HSE will advise against the continued use of the seven residential properties (the residential NSRs) on the west side of Queens Road and therefore that those properties are likely to need to be acquired for the Project. Air Products is currently in discussions with those landowners / occupiers with a view to negotiating acquisition of the seven residential properties. Where it is not possible to acquire those properties through negotiation, acquisition powers for these properties will be sought through the DCO. In the event of acquisition of the properties ahead of the either construction or operation commencing, the adverse effect would not arise.

7.10.2 At residential NSRs to the west at the eastern edge of Immingham (represented by NSR3), residual construction noise effects are likely to be of negligible adverse significance (not significant, and below the LOAEL).

Operation

7.10.3 Based on the implementation of the impact avoidance measures, and following implementation of additional noise specific mitigation measures, which will help minimise the risk of noise complaints and potential enforcement action under the EPA by NELC, this preliminary assessment concludes that residual effects at residential NSRs on Queens Road (represented by NSR1 and NSR2) from operational sound may be of up to moderate/major adverse significance (significant, and above the SOAEL) from on-site operations. With respect to off-site traffic, this preliminary assessment concludes that residual road traffic noise effects at residential NSRs on Queens Road is likely to be of negligible adverse significance (not significant).

7.10.4 At residential NSRs at the eastern edge of Immingham (represented by NSR3), residual effects of operational sound are likely to be of negligible/low adverse significance (not significant, and below the LOAEL) once mitigation measures have been deployed.

7.10.5 During detailed design, an operational noise control scheme (including agreed noise limits) will be prepared, secured by a Requirement of the draft DCO, which would demonstrate use of BAT for the control of noise for the Environmental Permit.

Decommissioning

7.10.6 Residual effects during decommissioning of the hydrogen production facilities are expected to be equivalent to those presented above for construction.

7.11 Summary of Preliminary Assessment

7.11.1 A summary of the impact pathways that have been assessed, and the identified residual effects and level of confidence are presented in **Table 7.24**.

Table 7.24 Summary of potential impact, mitigation measures and residual effects

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Effect	Confidence
Construction Phase					
Residential NSRs on Queens Road	Construction Noise - Landside works	Potentially up to major adverse (significant) (daytime)	Standard impact avoidance construction noise and vibration mitigation measures, plus additional specific measures where possible	Potentially up to moderate/major (significant)*	Medium
Residential NSRs on eastern edge of Immingham	Construction Noise - Landside works	Potentially up to minor adverse (not significant) (daytime)	Standard impact avoidance construction noise and vibration mitigation measures, plus additional specific measures where possible	Negligible/minor (not significant)	Medium
Residential NSRs on Queens Road	Construction Traffic	Minor adverse (not significant) (daytime)	Potentially construction traffic management, to be confirmed as the EIA progresses	Minor/negligible adverse (not significant)*	Medium
Residential NSRs on eastern edge of Immingham	Construction Traffic	Negligible/minor adverse (not significant) (daytime)	N/A	Negligible/minor adverse (not significant)	Medium
Immingham Oil Terminal Jetty/ Pipeline	Construction/Piling Vibration	Potentially significant, depending upon distance separation	Increase distance between The Project jetty and the existing Immingham Oil Terminal Jetty/ Pipeline	Negligible/minor adverse (not significant)	Medium

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Effect	Confidence
Operational Phase					
Residential NSRs on Queens Road	On-site plant noise and operations	Up to major adverse (significant) (daytime and night-time)	Limits on noise emissions from plant and equipment at source. Acoustic barriers/screens or earth bunds to reduce transmission of noise from the Site to NSRs. Recommendation for provision of a package of sound insulation to nearby NSRs, as a last resort, where other applied measures are unlikely to be adequate.	Up to moderate/major adverse (significant) (daytime and night-time)*	Medium/High
Residential NSRs on eastern edge of Immingham	On-site plant noise and operations	Up to moderate/major adverse (significant) (daytime) and up to major adverse (significant) (night-time)	Limits on noise emissions from plant and equipment at source. Acoustic barriers/screens or earth bunds to reduce transmission of noise from the Site to NSRs.	Minor adverse (not significant)	Medium/High
Residential NSRs on Queens Road	Project traffic on local roads	Negligible adverse (not significant) (daytime and night-time)	N/A	Negligible (not significant)	Medium
Residential NSRs on eastern edge of Immingham	Project traffic on local roads	Negligible/minor adverse (not significant) (daytime and night-time)	N/A	Negligible/minor adverse (not significant)	Medium
Decommissioning Phase – as per construction phase					

* As explained in Chapter 22: Major Accidents and Disasters, Table 22.2, further assessment is required of the consequences of the operation of the hydrogen production facility on surrounding land uses in terms of major hazard planning. It is currently anticipated that the HSE will advise against the continued use of the seven residential properties (the residential NSRs) on the west side of Queens Road and therefore that those properties are likely to need to be acquired for the

Project. The Applicant is currently in discussions with those landowners / occupiers with a view to negotiating acquisition of the seven residential properties. Where it is not possible to acquire those properties through negotiation, acquisition powers for these properties will be sought through the DCO. In the event of acquisition of the properties ahead of the either construction or operation commencing, the adverse effect would not arise.

7.12 References

Ref 7-1 British Standards Institute (BSI). (2003). BS 7445-1 – Description and measurement of environmental noise. Guide to quantities and procedures

Ref 7-2 British Standards Institute (BSI). (2014). BS 5228:2009+A1:2014: Code of practice for noise and vibration control on construction and open site– Part 1: Noise'.

Ref 7-3 British Standards Institute (BSI). (2014). BS 5228:2009+A1:2014: Code of practice for noise and vibration control on construction and open site – Part 2: Vibration'.

Ref 7-4 British Standards Institute (BSI). (2014). BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings'.

Ref 7-5 British Standards Institute (BSI). (2019). BS 4142:2014+A1:2019: 'Methods for rating and assessing industrial and commercial sound'.

Ref 7-6 Control of Pollution Act 1974 (c. 40). Available online: https://www.legislation.gov.uk/ukpga/1974/40.

Ref 7-7 Department for Environment, Food and Rural Affairs (Defra). (2010). Noise Policy Statement for England.

Ref 7-8 Department for Transport (DfT). (2012). National Policy Statement for Ports.

Ref 7-9 Department of Transport (DfT)/ Welsh Office. (1998). Calculation of Road Traffic Noise.

Ref 7-10 European Commission (2002). Directive 2002/49/EC Environmental Noise Directive -END.

Ref 7-11 Highways England. (2020). Design Manual for Roads and Bridges LA111 Noise and vibration – Version 2.

Ref 7-12 Institute of Environmental Management and Assessment (IEMA). (2014). Guidelines for Environmental Noise Impact Assessment.

Ref 7-13 International Standards Organization (Part 1: 1993, Part 2: 1996) ISO 9613 – Acoustics – Attenuation of sound during propagation outdoors, ISO.

Ref 7-14 Ministry of Housing, Communities and Local Government (MHCLG). (2019). Planning Practice Guidance.

Ref 7-15 Ministry of Housing, Communities and Local Government (MHCLG). (2021). National Planning Policy Framework.

Ref 7-16 North East Lincolnshire Council. (2018). North East Lincolnshire Local Plan.

Ref 7-17 North Lincolnshire Council (2016) North Lincolnshire Council Planning for Health and Wellbeing-Supplementary Planning Document.

Ref 7-18 Secretary of State, H. M. Government (2006, as amended). The Environmental Noise (England) Regulations 2006. Statutory Instrument 2006 No. 2238.

Ref 7-19 The Environmental Protection Act 1990 (c. 43). Available online: https://www.legislation.gov.uk/ukpga/1990/43/contents .

Ref 7-20 TRL (2006) Method for converting the UK road traffic noise index $L_{A10,18h}$ to the ES noise indices for road noise mapping.

Ref 7-21 British Standards Institute (1993) BS 7385-2: 1993 'Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration'.

Ref 7-22 International Organization for Standardization (ISO) (2010) ISO 4866:2010.

Ref 7-23 ECUS (2013) Kings Road Industrial Development, Immingham. Environmental Impact Assessment.

7.13 Abbreviations and Glossary of Terms

Table 7.25 Glossary and Abbreviations

Term	Acronym	Definition
Annual average weekday traffic (for the 18-hour period between 06.00 – 24.00)	AAWT	Total volume of traffic, weekdays only, on a road or motorway for a year divided by the number of weekdays in the year.
Associated British Ports	ABP	One of the UK's leading and best-connected ports groups, owning and operating 21 ports across England, Wales and Scotland.
Basic Noise Level	BNL	A measure of source noise.
British Standard	BS	Standard produced by the British Standards Institution.
British Standards Institution	BSI	A group which produces British Standards across industry sectors ad which is formally designated as the National Standards Body for the UK.
Calculation of Road Traffic Noise	CRTN	A technical memorandum that describes the procedures for calculating noise from road traffic.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Department for Environment, Food and Rural Affairs	DEFRA	The Government department responsible for policy and regulations on environmental, food and rural issues. The department's priorities are to grow the rural economy, improve the environment and safeguard animal and plant health.
Design Manual for Roads and Bridges	DMRB	The Design Manual for Roads and Bridges contains information about current standards relating to the design, assessment and operation of motorway and all-purpose trunk roads in the United Kingdom.
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.
Environmental Protection Act 1990	EPA	Act of Parliament of the UK that defines the fundamental structure and authority for waste management and control of emissions into the environment.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
European Union	EU	An economic and political union of 28 countries which operates an internal (or single) market which allows the free movement of goods, capital, services and people between member states.

Term	Acronym	Definition
His Majesty's Stationery Office	HMSO	A former British government organisation that was responsible for publishing certain important government documents, including official reports and papers detailing laws.
Institute of Environmental Management and Assessment	IEMA	A professional body for practitioners working in the fields of environmental management and assessment.
Lowest Observable Adverse Effect Level	LOAEL	Level above which adverse effects on health and quality of life can be detected.
Likely Significant Effect	LSE	Any effect that may reasonably be predicted as a consequence of the plan or project.
Ministry of Housing, Communities and Local Government	MHCLG	A department of His Majesty's Government responsible for housing, communities, local government in England and the levelling up policy. (Now called Department for Levelling Up Housing and Communities)
No Observed Adverse Effect Level	NOAEL	The level below which no adverse effect can be detected.
No Observed Effect Level	NOEL	The level below which no effect can be detected.
National Planning Policy Framework	NPPF	A planning framework which sets out the Government's planning policies for England and how these are expected to be applied.
Noise Policy Statement for England	NPSE	Statements prepared and designated by the Secretary of State under the Planning Act 2008, which establish national policy for Nationally Significant Infrastructure Projects, including energy, transport and water, wastewater and waste and against which applications for Development Consent Orders are assessed.
National Policy Statement for Ports	NPSfP	The National Policy Statement for Ports provides the framework for decisions on proposals for new port development.
Nationally Significant Infrastructure Projects	NSIP	A type of project listed in the Planning Act 2008, which must be consented by a Development Consent Order.
Noise Sensitive Receptors	NSR	Receptors which are potentially sensitive to noise. These comprise mainly residential buildings, but also include educational buildings, hospitals and places of worship.
Preliminary Environmental Information Report	PEIR	A report that compiles and presents the Preliminary Environmental Information gathered for a project.
Planning Inspectorate	PINS	An executive agency with responsibilities for planning appeals, national infrastructure planning applications, local plan examinations and other planning-related casework in England and Wales.

Term	Acronym	Definition
Planning Practice Guidance	PPG	A series of guidance documents which support the content of the National Planning Policy Framework.
Significant Observed Adverse Effect Level	SOAEL	The level above which significant adverse effects on health and quality of life occur.
Sound Pressure Levels	SPL / L_p	The parameter by which sound levels are measured in air. It is measured in decibels. The threshold of hearing has been set at 0 dB, while the threshold of pain is approximately 120 dB. Normal speech is approximately 60 dB at a distance of 1 metre and a change of 3 dB in a time varying sound signal is commonly regarded as being just detectable. A change of 10 dB is subjectively twice, or half as loud.
Sound Power Levels	SWL / L_{wA}	A measure of the acoustic energy emitted from a source of noise, expressed in decibels.
Unacceptable Adverse Effect Level	UAEL	Noise perceived as noticeable and very disruptive.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 8: Nature Conservation (Terrestrial Ecology)

Associated British Ports

Document History

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Table of contents

Chapter Pages

Tables

8 Nature Conservation (Terrestrial Ecology)

8.1 Introduction

8.1.1 This chapter presents the preliminary findings of the assessment of the likely effects of the Project on nature conservation (terrestrial ecology).

8.1.2 The Project would be located partly within, and partly on land adjacent to, the Humber Estuary Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar site and Site of Special Scientific Interest (SSSI), collectively referred to as the Humber Estuary European Marine Site (EMS). All effects on the designated features of the Humber Estuary EMS are assessed in **Chapter 9: Nature Conservation (Marine Ecology)** and **Chapter 10: Ornithology** respectively, and therefore this chapter does not include an assessment of the impacts of the Project on the Humber Estuary EMS.

8.1.3 There may be interrelationships related to the potential effects on terrestrial ecology and other disciplines. Therefore, also refer to the following chapters:

a. **Chapter 6: Air Quality**: this chapter assesses potential interactions between the Project and the designated habitats of the Humber Estuary EMS.

b. **Chapter 7: Noise and Vibration**: this chapter this chapter assesses potential interactions between the Project and the designated features of the Humber Estuary EMS that are sensitive to noise and vibration.

c. **Chapter 9: Nature Conservation (Marine Ecology**): this chapter assesses potential interactions between the Project and the designated marine and intertidal habitat features of the Humber Estuary EMS.

d. **Chapter 10: Ornithology**: this chapter assesses impacts on the qualifying bird interest of the Humber Estuary SPA/ Ramsar and SSSI, including marine, coastal and supporting terrestrial habitats (i.e. functionally linked land). The assessment considers passage, overwintering and breeding bird species (including non-SPA/ Ramsar breeding birds).

8.1.4 This chapter is also supported by the following figures and appendices:

a. **Appendix 8.A:** Ecological Impact Assessment Methods (PEI Report, Volume IV).

b. **Appendix 8.B:** Land off Kings Road, Immingham Preliminary Ecological Appraisal Report (PEI Report, Volume IV).

8.2 Approach to Assessment

Scope and Methods

8.2.1 An EIA scoping exercise was undertaken in August 2022 to establish the form and nature of the nature conservation (terrestrial ecology) assessment, and the approach and methods to be followed. However, terrestrial ecology surveys were commenced in advance of the formal scoping process given the seasonal constraints associated with field survey work. The scope of the terrestrial ecology

surveys was therefore defined at an early stage in the process based on similar projects in the Immingham area undertaken by AECOM.

8.2.2 The Scoping Report (**Appendix 1.A** of PEI Report, Volume IV) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on nature conservation (terrestrial ecology).

8.2.3 The approach to Ecological Impact Assessment (EcIA) for the Project remains as summarised in the Scoping Report, with further details regarding the technical approach provided in **Appendix 8.A** (PEI Report, Volume IV).

8.2.4 Following receipt of the Scoping Opinion (**Appendix 1.B** of PEI Report, Volume IV), the following requirements have been identified by the Planning Inspectorate which will be considered as part of the ongoing nature conservation (terrestrial ecology) assessment:

a. Evidence based assessment of potential impacts on bats and their roosts.

b. Reptiles can be scoped out of the assessment provided that precautionary working methods are specified and committed.

c. Further information on habitat suitability for white-clawed crayfish (*Austropotamobius pallipes*) in support of the case for scoping this species out of the assessment.

d. All relevant statutory nature conservation designations are to be identified with reference to the Impact Risk Zones (IRZs) (defined by Natural England).

8.2.5 Having regard to the information presented within the Scoping Report (**Appendix 1.A** in PEI Report Volume IV), the Planning Inspectorate's Scoping Opinion (**Appendix 1.B** in PEI Report, Volume IV) has also confirmed the Applicant's view that significant effects on reptiles and Local Wildlife Sites (LWS) are unlikely. Accordingly, these matters will remain scoped out of consideration in the Environmental Statement (ES). **Table 8.1:** summarises the consultation undertaken to date to inform this chapter, as well as where comments have been addressed within the chapter.

Table 8.1 Scoping Opinion Comments on Nature Conservation (Terrestrial Ecology)

Consultee	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	The Scoping Report proposes to scope out further surveys for bat foraging and commuting activity at the West Site due to the prevalence or low quality or unsuitable habitat and because usage would likely be on an occasional and transient basis by small numbers of foraging/ commuting common species of bats. In light of the evidence provided in Appendix C, the Inspectorate agrees that further bat surveys can be scoped out for the West Site only.	No further comment required.
	The Scoping Report notes there are a large number of mature oak and ash trees within Long Strip woodland (Pipeline area) that maybe suitable for roosting bats, but it assumes that all mature trees would be avoided by the Proposed Development. It states that should it become necessary to remove/ prune any mature trees, further assessment work for bats would be undertaken to inform mitigation/ licensing requirements as necessary. The Inspectorate does not agree that this matter can be scoped out at this time. Suitable trees should be evaluated for their roosting potential and this information should be used to inform design development and the assessment of effects. Should substantial bat populations be identified the potential for impacts on foraging/commuting would need to be revisited.	Clarification added at **Paragraph 8.3.17** that further inspections of trees for bats will be undertaken as necessary and reported in the ES.

	The Scoping Report states that none of the habitats within the Proposed Development's DCO site boundary have been found to be suitable for reptiles, as they lack the diverse habitat mosaic and varied topography favoured by species of reptiles for basking, refuge and hibernation and adds that in context with the lack of known reptile populations in this part of the county, it is reasonable to conclude that they are likely absent. The Scoping Report also states that the low risk of presence of grass snake on the main drain at the foot of the flood embankment can be addressed through a precautionary approach/ method statement for vegetation clearance during construction. The Inspectorate agrees that this matter can be scoped out of the assessment on this basis. The ES should set out the relevant precautionary working methods proposed to be adopted.	Precautionary working methods will be provided in the final ES with reference to the final design and Site boundary.
	Impacts on designated marine ecology features would be assessed in accordance with ES Chapter 8 and impacts on designated ornithology features would be assessed in accordance with Chapter 9. The Inspectorate agrees that this matter can be scoped from terrestrial ecology assessment on the basis that no impacts are anticipated on the Humber Estuary Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar and Site of Special Scientific Interest (SSSI), collectively referred to as the Humber EMS, and as impacts on marine ecology and ornithology for these designated sites will be assessed elsewhere in the ES.	No further comment required.

	The preliminary ecological appraisal (Appendix C of the Scoping Report) states that ditches within the Proposed Development site boundary are unsuitable for white-clawed crayfish and therefore the species will not be considered further. The appraisal appears to relate only to the West Site of the Proposed Development site. The Inspectorate agrees that this matter may be scoped out for the West site but does not agree that this matter can be scoped out for the other parts of the site unless evidence demonstrating that ditches are unsuitable for white-clawed crayfish is provided for the other parts of the Proposed Development site in the ES or information which demonstrates agreement with the relevant consultation bodies and the absence of a likely significant effect.	The PEA will be updated and included with the ES. All areas of site will be included within the appraisal as evidence to support this conclusion.
	The Scoping Report considers the Humber Estuary Site of Special Scientific Interest (SSSI) may be affected by the Proposed Development but does not explicitly refer to other SSSIs or SSSI impact risk zones. The Inspectorate advises that all relevant SSSI designated sites and impact risk zones should be considered in the assessment (including North Killingholme Haven Pits SSSI and The Lagoons SSSI) and evidence which demonstrates that the Proposed Development is unlikely to have any significant adverse effects on these should be provided in the ES.	North Killingholme Haven Pits SSSI, as a saline lagoon connected to the European Marine Site, falls within the potential scope of **Chapters 9 and 10.** It is not designated for features of relevance to the terrestrial ecology chapter. The Lagoons SSSI is located at distance (north of the Humber), the outer IRZ band extends to c. 9.9km from the SSSI so the site (nearest terrestrial part of Order Limits is c. 19km from the SSSI) is not located within its IRZ. On this basis, all relevant SSSIs have been considered and the ES will provide further clarity on this point to permit scoping out.
Natural England	We note and welcome the report's consideration of impacts upon local wildlife and geological sites. Local Sites are identified by the local wildlife trust, geoconservation group or a local forum established for the purposes of identifying and selecting local sites.	Mitigation proposals will be included in the final ES, if required, based on the final design and Order Limits, and with reference to the conclusions of the Air Quality Impact Assessment.

	They are of county importance for wildlife or geodiversity. We welcome the report's inclusion of an assessment of the likely impacts on the wildlife and geodiversity interests of such sites. Further information on local wildlife Sites is available from the Yorkshire Wildlife Trust - 01904659570 or Email: info@ywt.org.uk. The ES should set out proposals for mitigation of any impacts and if appropriate, compensation measures and opportunities for enhancement and improving connectivity with wider ecological networks. They may also provide opportunities for delivering beneficial environmental outcomes.	
North East Lincolnshire Council	The site appears to be adjacent to W2 of North East Lincolnshire Borough Council No. 107 (Long Wood, Laporte Road, Stallingborough) Tree Preservation Order 2002. There is a defined drainage ditch between the site and the woodland. I am aware that this site is managed by the Humber Nature Partnership and that there is a management plan in place. Given the woodland is covered by a TPO I feel the impact of the proposal on the woodland should be considered within the EIA.	The potential impact of the Project on the TPO woodland will be fully quantified and considered within the EIA.

8.3 Assessment Method

8.3.1 **Appendix 8.A** (PEI Report, Volume IV) provides details of the ecological impact assessment methods.

8.4 Legislation, Policy and Guidance

8.4.1 **Table 8.2** presents a summary of the legislation, policy and guidance relevant to the nature conservation (terrestrial ecology) assessment and details how their requirements will be met by the Project.

Table 8.2 Relevant Legislation, Policy and Guidance Regarding Nature Conservation (Terrestrial Ecology)

Legislation/ Policy/ Guidance	Consideration within the PEI Report
The Conservation of Habitats and Species Regulations *2017 (as amended)* (Ref 8-1)	
The Regulations provide for the protection of 'European sites' and the protection of 'European protected species'. The Regulations make it an offence (subject to exceptions) to deliberately capture, kill, disturb, or trade in the animals listed in Schedule 2, or pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 4. However, these actions can be made lawful through the granting of licenses by the appropriate authorities. The Regulations require competent authorities to consider or review applications for planning permission/ consents for projects through an appropriate assessment of the plan/ project.	**Section 8.3** identifies European Sites and European Protected Species relevant to this assessment. **Section 8.4** summarises how these have been addressed in the Project design (this will be considered in more detail in the ES). **Sections 8.5-8.7** provide an assessment of potential impacts and effects, and any related requirements for avoidance/ mitigation/ compensation measures. Assessment in respect of the Humber Estuary EMS and its designated features is considered in **Chapter 9: Nature Conservation (Marine Ecology).**
Wildlife and Countryside Act (WCA) 1981 (as amended) (Ref 8-2)	
Part 1 of the WCA affords general protection to all species of wild bird, and specific protection to flora and fauna listed in Schedules 1 (birds protected by special penalties), 5 (other animals), and 8 (flora, fungi and lichens). In certain circumstances, licences can be granted to permit some actions prohibited under the Act. Schedule 9 provides lists of non-native flora and fauna that it is an offence to release or cause to spread in the wild. Of primary relevance in the context of proposed developments are flora e.g. invasive non-native plant species. Part 2 of the WCA details the law regarding SSSI and other protected areas within Great Britain.	**Section 8.3** identifies SSSIs and protected and invasive species relevant to this assessment. **Section 8.4** summarises how these have been addressed in the Project design (this will be considered in more detail in the ES). **Sections 8.5-8.7** provide an assessment of potential impacts and effects, and any related requirements for avoidance/ mitigation/ compensation measures.

Legislation/ Policy/ Guidance	Consideration within the PEI Report
Natural Environment and Rural Communities (NERC) Act 2006 (Ref 8-3)	
Through Section 40 of the Act, a legal duty is placed on Government Departments and public authorities to have regard for the conservation of biodiversity. This 'biodiversity duty' includes, but is not restricted to, habitats and species of principal importance for nature conservation in England published by the Government in accordance with the requirement set through Section 41 of the Act.	**Section 8.3** identifies important habitats and species relevant to this assessment including those named on Section 41 of the Act. **Section 8.4** summarises how these have been addressed in the Project design (this will be considered in more detail in the ES). **Sections 8.5-8.7** provide an assessment of potential impacts and effects, and any related requirements for avoidance/ mitigation/ compensation measures.
Protection of Badgers Act 1992 (Ref 8-4)	
This Act makes it an offence to kill or take a badger, to cruelly ill-treat a badger, or to interfere with a badger sett, including disturbing a badger while it is occupying a sett. In certain circumstances, licences can be granted to permit some actions prohibited under the Act.	Surveys have been completed to identify if badgers are likely to be affected. **Section 8.3** confirms this species is not a constraint to the Project.
The Hedgerow Regulations 1997 (Ref 8-5)	
The regulations do not apply to acts of hedgerow removal covered by the process for granting planning permission. However, it retains value as part of the process for determining the relative value of specific hedgerows/ hedgerow networks and requirements for appropriate mitigation	Surveys have been completed to identify locations where hedgerows occur (see **Section 8.3**). **Section 8.4** summarises how these have been addressed in the Project design (this will be considered in more detail in the ES), while **Sections 8.5-8.7** provide an assessment of potential impacts and effects, and any related requirements for avoidance/ mitigation/ compensation measures.
Invasive Alien Species (Enforcement and Permitting) Order 2019 (Ref 8-6)	
The Order allows for the enforcement of European Union Regulation No. 1143/2014 on the prevention and management of the introduction and spread of invasive alien species within England. The Regulation lists species of European Union concern which cannot be imported, kept, bred/ grown, transported, sold, used, allowed to reproduce, or released into the environment. The Order therefore tightens existing rules (e.g. under the Wildlife and Countryside Act 1981 (as amended)) around releasing invasive non-native animals which threaten our native wildlife.	Surveys have been completed to identify if any terrestrial invasive non-native plant species are present on the Site **Section 8.3** confirms that there are no known occurrences of invasive non-native plant species within the Site.
National Policy Statement for Ports 2012 (NPSfP*)* (Ref 8-7)	
Section 5.1 (Biodiversity and geological conservation) provides the nature conservation	**Section 8.3** identifies the terrestrial designations, habitats and species relevant to this assessment.

Legislation/ Policy/ Guidance	Consideration within the PEI Report
framework for decisions on proposals for new port development.	**Section 8.4** summarises how these have been addressed in the Project design (this will be considered in more detail in the ES). **Sections 8.5-8.7** provide an assessment of potential impacts and effects, and any related requirements for avoidance/ mitigation/ compensation.
National Planning Policy Framework (NPPF) 2021 (Ref 8-9)	
Chapter 15 (*Conserving and enhancing the natural environment*) sets out government planning policies for England and how decision-making should contribute to and enhance the natural and local environment. Specifically, the following principles should be applied: a) if significant harm to biodiversity cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused. b) development on land within or outside a SSSI and which is likely to have an adverse effect on it (should not normally be permitted. c) development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists. d) development whose primary objective is to conserve or enhance biodiversity should be supported; while opportunities to improve biodiversity in and around developments should be integrated as part of their design.	**Section 8.3** identifies the SSSIs and biodiversity features relevant to this assessment. **Section 8.4** summarises how these have been addressed in the Project design (this will be considered in more detail in the ES). **Sections 8.5-8.7** provide an assessment of potential impacts and effects, and any related requirements for avoidance/ mitigation/ compensation.
Government Standing Advice (Ref 8-10 and 8-11)	
The purpose of standing advice is to guide decision-makers on the determination of proposals with potential to affect protected sites, habitats and species.	This advice has informed the overall survey and assessment approach in respect of protected species/ habitats, which is set out in **Table 8.3** (field survey scopes and methods) and **Appendix 8.A** (PEI Report Volume IV) (assessment scope and methods).
Local Policy	
North East Lincolnshire Local Plan 2018 (Ref 8-12)	

Legislation/ Policy/ Guidance	Consideration within the PEI Report
Policy 9 – Habitat Mitigation – South Humber Bank. This policy requires that proposals within the Mitigation Zone, which will adversely affect the Humber Estuary SPA / Ramsar site due to loss of functionally linked land to provide their own mitigation to comply with the requirements of the Habitats Regulations. Policy 41 – Biodiversity and Geodiversity. This policy sets out a strategic approach, which positively plans for the creation, protection, enhancement and management of sites of biodiversity and geodiversity value.	The Project is located within the Mitigation Zone identified on the policies map and therefore falls within the remit of this policy where land that is functionally linked to the Humber Estuary SPA/ Ramsar site is lost to development. The relevant terrestrial habitats are identified in **Section 8.3**, but the impact assessment is covered in **Chapter 10: Ornithology** given the relevant qualifying interest features are birds. Surveys are ongoing to determine whether land within the Project boundary is functionally linked to the SPA/ Ramsar (the scope and methods for the survey are set out in Chapter 10: Ornithology). **Section 8.3** identifies the biodiversity features relevant to this assessment. **Section 8.4** summarises how these have been addressed in the Project design (this will be considered in more detail in the ES). **Sections 8.5-8.7** provide an assessment of potential impacts and effects, and any related requirements for avoidance/ mitigation/ compensation.
Lincolnshire Biodiversity Action Plan (Ref 8-13)	
Identifies biodiversity conservation objectives within the region and provides action plans for priority habitats, species, locally important wildlife and sites.	**Section 8.3** identifies the biodiversity action plan habitats and species relevant to this assessment. **Section 8.4** summarises how these have been addressed in the Project design (this will be considered in more detail in the ES). **Sections 8.5-8.7** provide an assessment of potential impacts and effects, and any related requirements for avoidance/ mitigation/ compensation measures.

Stakeholder Engagement

8.4.4 A range of stakeholders, including Natural England, have been engaged as part of the scoping process to obtain their views on the Project and the scope of the nature conservation (terrestrial ecology) assessment, the results of which are presented within the Scoping Opinion (**Appendix 1.B** of PEI Report Volume IV).

8.4.5 Further formal consultations will be undertaken to inform the final Project design and to agree the findings of the ecological impact assessment, and any requirements for avoidance/ mitigation/ compensation measures, and a scheme of biodiversity enhancement.

8.5 Study Areas

8.5.1 The following study areas are applicable to the nature conservation (terrestrial ecology) assessment:

a. Desk Study Area: defined as land within the Site boundary and a 2km buffer for obtaining baseline data pertaining to terrestrial statutory and non-statutory designated sites, protected species and UK Priority habitats and species. The IRZs defined by Natural England have also been used to identify the SSSIs of relevance to this assessment.

b. Habitat Survey Area: all terrestrial land within the Site boundary (excluding the jetty) and up to 50m from the Site boundary where accessible/ visible from adjacent land. This includes permanent land take and temporary laydown areas.

c. Species Survey Areas: these were defined on a case by case basis (refer to **Table 8.2**) in accordance with the good practice survey guidelines for the species concerned and with consideration of the likely pathways for impact.

8.5.2 The potential zone of influence, as defined by the Chartered Institute of Ecology and Environmental Management (CIEEM) guidance and outlined below, seeks to consider the potential distance from the activities being conducted to facilitate the construction (or operation) of the Project, and the designated sites, habitats or species present that may be affected by those activities e.g. the terrestrial habitats within which great crested newt may disperse from a breeding pond. The study and survey areas were considered sufficient to collate ecological baseline data to inform an EcIA for the Project and to account for the potential effects likely to occur within the relevant zone of influence for each ecological feature.

Desk Study

8.5.3 A desk-based study was undertaken to obtain terrestrial ecology data from the following key sources:

a. Multi-Agency Geographical Information for the Countryside (MAGIC) website (Ref 8-14) for statutory designated sites and ancient woodlands within 2km of the Project.

b. Natural England website (Ref 8-15) for information on statutory designated sites of nature conservation interest within 2km of the Project and to confirm reasons for designation and site condition.

c. Natural England Priority Habitat Inventory for records of priority habitats within 2km of the Project (accessible via MAGIC, see above).

d. Lincolnshire Ecological Records Centre (LERC) for non-statutory designated sites and for records of protected and notable species within 2km of the Project.

e. Local authority planning portal for any potentially relevant ecological records pertaining to the Site boundary and its immediate surrounds.

Field Surveys

8.5.4 The scope of field surveys undertaken is detailed in **Table 8.3**, along with references to the relevant methods and guidance adopted for each survey, and the dates of each survey. The relevant areas of the Site are defined in **Chapter 2: The Project** and shown on **Figure 2.2** (PEI Report, Volume III).

8.5.5 Additional Phase 1 habitat and Phase 2 protected species surveys were undertaken in 2022 to reflect the changes in the Site boundary that occurred since the original Preliminary Ecological Appraisal (PEA) Report was prepared for the West Site (as submitted with the Scoping Report (**Appendix 8.B** of PEI Report Volume IV)). These are summarised in **Table 8.3** below.

Table 8.3: Summary of Field Surveys undertaken in 2022

Survey	Field Survey Method	Field Survey Scope	Timing
Phase 1 habitat survey	Phase 1 Habitat Survey in accordance with the published method (Ref 8-16). Assessment of possible presence of protected, priority or otherwise notable species and, where relevant, the likely importance of habitat features for such species. Record of Invasive Non-Native Species (INNS) of plants. Incidental records of protected or priority species or their field signs.	• All habitats within the Site boundary	March – June 2022
Woodland ground flora survey	Walkover survey to record detailed botanical species listed within woodland habitats.	• Long Strip Woodland (see **Figure 2.4** (PEI Report, Volume III)	June 2022
Badger	Walkover survey to record any field signs of badger such as setts, latrines, or footprints.	• All habitats within the Site boundary	March – June 2022
Bats – foraging/ commuting	Monthly walked bat activity transects in suitable habitats in accordance with standard methods (Ref 8-17).	• Long Strip Woodland • East Site south of Laporte Road	June, July, August and September 2022
	Monthly deployment of remote static bat detectors in suitable habitats for a minimum of five days per deployment.	• Long Strip Woodland • East Site south of Laporte Road	June, July, August and September 2022
Otter	Presence/ absence survey for field signs.	• Main ditch adjacent to flood embankment.	September/ October 2022
Water vole	Presence/ absence survey following standard methods (Ref 8.18).	• All ditches within the Site boundary	May and September/ October 2022
Great crested newt	Habitat Suitability Index (HSI) assessment in accordance with standard methods (Ref 8-19).	• No ponds within 250m of the Project were accessible in spring 2022.	N/A
	Environmental DNA (eDNA) sampling.	• No ponds within 250m of the Project were accessible in spring 2022.	June 2022

Survey	Field Survey Method	Field Survey Scope	Timing
		• Ditch at the base of the flood embankment was subject to eDNA sampling.	
Terrestrial invertebrates	Habitat site appraisal by invertebrate specialist.	• West Site • East Site south of Laporte Road • Long Strip Woodland	June 2022

Field Surveys Scoped Out

8.5.6 As set out in the Scoping Report (**Appendix 1.A** of PEI Report Volume IV) and agreed within the Scoping Opinion (**Appendix 1.B** of PEI Report Volume IV), surveys for the following species were scoped out:

a. Bat foraging/ commuting activity at the West Site: the habitats comprise mainly open tall-swarded grassland with some areas of dense scrub. Given the open and exposed nature of the West Site, it is considered unlikely that the habitats would be used on anything other than an occasional and transient basis by small numbers of foraging/ commuting common species of bats. Further bat surveys of this habitat are therefore scoped out.

b. Reptiles: none of the habitats within the Site boundary have been found to be suitable for reptiles, as they lack the diverse habitat mosaic and varied topography favoured by species of reptiles for basking, refuge and hibernation. The ditches are mainly dry and therefore unsuitable for grass snake, with the exception of the main drain at the foot of the flood embankment. When considered in context with the lack of known reptile populations in this part of the county, it is reasonable to conclude that they are likely absent. The low risk of presence of grass snake on the main drain at the foot of the flood embankment would be addressed through a precautionary approach/ method statement for vegetation clearance during Project construction.

c. White-clawed crayfish: none of the ditches within the Site boundary are suitable for this species, so further survey is not needed.

8.5.7 An updated PEA report will be prepared for the ES Chapter to include all habitats within the Site boundary, as it is acknowledged that the Scoping Report was supported by a PEA that only considered habitats within the West Site. However, this preliminary assessment has taken into account the results of all surveys undertaken (as set out in **Table 8.3**).

Limitations and Assumptions

8.5.8 The information presented in this preliminary assessment reflects that obtained and evaluated at the time of reporting and is based on an emerging design for the Project and the maximum likely extents of land required for its construction and operation.

8.5.9 The findings of this preliminary assessment, which at present is by necessity precautionary and worst case, may be subject to change as the design of the Project is developed and refined further through the assessment and consultation

processes, and as further research and investigative surveys are completed to fully understand its potential effects.

8.5.10 Some areas of land within the Site were inaccessible for the purposes of survey and were therefore mapped from adjacent land and verified with reference to available aerial imagery. Given the relatively low value of the ecological habitats within the Site, it is not considered that this represents a significant constraint to the preliminary assessment in respect of most protected species and priority habitats. Where there is room for doubt over potential impacts and effects, a precautionary assessment has been presented pending further work to address gaps in data coverage.

8.5.11 The PEA Report submitted with the Scoping Report was limited to consideration of the western part of the Project referred to as West Site. This comprised the disused arable land off Kings Road within which the main terrestrial elements of the Project would be located. Since the PEA was prepared and the Scoping Report submitted, there have been various amendments to the Site boundary as the design of the Project has evolved. It will therefore be necessary to update the Phase 1 habitat information to reflect these changes, and this information will be contained within an updated PEA to be submitted as an appendix to the nature conservation (terrestrial ecology) chapter of the ES. However, this preliminary assessment has taken into account the results of all surveys undertaken (as set out in **Table 8.3**).

8.5.12 Access to two waterbodies (Ponds 1 and 2) within the Associated Petroleum Terminal that are within 250m of the Project was not possible for the purposes of preliminary habitat suitability assessment or further survey work in respect of great crested newt. The Applicant will pursue options for accessing these waterbodies as the Project progresses. This remains a limitation to the assessment in relation to great crested newts at this stage, and the assumptions made are clearly stated herein.

8.6 Baseline Conditions

Current Baseline

8.6.1 The PEA Report included a Phase 1 Habitat survey and preliminary ecological appraisal of land within the West Site. As the Project design has evolved, the scope of ecological survey work has been extended as necessary, where access was permitted, to ensure that all terrestrial areas within the Site boundary (and within the relevant zones of influence) have been subject to an appropriate level of survey to inform an EcIA. The baseline information presented in the Scoping Report has therefore been updated herein, where relevant. The results of all surveys undertaken will be reported within the nature conservation (terrestrial ecology) chapter of the ES, whilst an updated PEA Report will be submitted as an appendix to the ES. Where survey access to some limited areas, has not yet been possible, the Applicant will seek to survey these sites in Spring 2023 and the results will be included in the ES.

8.6.2 Ecological receptors are valued in accordance with the standard Ecological Impact Assessment (EcIA) methodology as set out in **Appendix 8.A** (PEI Report, Volume IV).

Statutory Designated Sites

8.6.3 There are no statutory designated sites with IRZ that overlap the Site boundary and that have qualifying interest features of relevance to this assessment.

8.6.4 The marine elements of the Project are located within the Humber Estuary EMS which encompasses the Humber Estuary SPA, SAC, Ramsar and SSSI designations. The qualifying interest features (including subtidal and intertidal habitats, marine species and ornithology features) are outside the scope of the terrestrial ecology assessment. As such, no further consideration is given to the Humber Estuary EMS in this chapter. Direct and indirect impacts on the designated habitats and features are instead considered within **Chapter 9: Nature Conservation (Marine Ecology)** and **Chapter 10: Ornithology** respectively.

Non-statutory Designated Sites

8.6.5 The desk study identified one non-statutory designated site within 2km of the Project, namely the Laporte Road Brownfield Site Local Wildlife Site (LWS) which is located approximately 150m south-east of the Site boundary (the nearest of which is the proposed temporary construction compound off Laporte Road). This site is of County nature conservation value. No pathways by which this LWS could be affected by the Project have been identified at this stage and therefore no further consideration is given to it within this PEI Report.

Habitats

8.6.6 A summary of the habitats identified within the Habitat Survey Area is provided in **Table 8.4** using information from a combination of field survey and a review of aerial photography.

8.6.7 Most habitats within the Habitat Survey Area are of low ecological value, with the exception of the mature broad-leaved deciduous woodland of Long Strip (within the Pipeline area) as shown on **Figure 2.1** (PEI Report, Volume III). All habitats within the Habitat Survey Area except the woodland are therefore evaluated as being of Site nature conservation value only.

8.6.8 The woodland habitat within Long Strip is representative of the UK Priority Habitat type 'lowland mixed deciduous woodland' and the Local Biodiversity Action Plan (BAP) habitat 'trees and woodland'. Lincolnshire is noted to be *'…one of the least wooded counties in Britain'* with the predominance of agricultural cultivation meaning that woodlands have become reduced in extent and fragmented throughout the county's landscape (Ref 8-13). The woodland is also subject to a Tree Preservation Order (TPO) which applies to the whole woodland block (including the area on the south side of Laporte Road, which is outside the Site boundary). Interrogation of freely available historic maps indicates that "Long Strip" woodland was present on the 1889 Ordnance Survey Map where it was a continuous strip of woodland (Laporte Road having not been

constructed at that time). It is therefore likely that this area has been wooded from at least the middle of the 19th century. Given its rarity within the wider local area, but taking into account the fact that it is not subject to any local nature conservation designations (other than the TPO), this habitat is evaluated as being of Borough nature conservation value.

8.6.9 Detailed information on habitats will be presented in a revised PEA Report to be submitted as a technical appendix to the nature conservation (terrestrial ecology) chapter of the ES.

Table 8.4: Summary of Habitats within Habitat Survey Area

Habitat	Brief Description
Semi-improved grassland	Dominant habitat in West Site having originated from three abandoned arable fields (abandoned from agricultural cultivation approximately ten years ago). Comprises tall swarded poor semi-improved grassland and tall ruderals dominated by false oat-grass (*Arrhenatherum elatius*) with tall fescue (*Schedonorus arundinaceus*), tufted hair-grass (*Deschampsia cespitosa*) and meadow foxtail (*Alopecurus pratensis*).
Scrub	Self-seeded goat willow (*Salix caprea*) scrub has become established in the western and eastern parts of the West Site. Dense areas of self-seeded silver birch (*Betula pendula*) and bramble are present around a central cleared area in the East Site.
Hedgerow	The former arable field boundaries in the West Site are marked by overgrown species-poor hawthorn (*Crataegus monogyna*) hedgerows with parallel ditches choked with common reed (*Phragmites australis*).
Arable	The temporary compound off Laporte Road occupies a large arable field (approximately 15ha) fronting the estuary, which was under a wheat crop at the time of the Phase 1 Habitat survey in March 2022.
Hardstanding	Areas of hardstanding are present within the Habitat Survey Area associated with the existing port road network and land currently in use for port-related storage.
Broad-leaved woodland	The Pipeline and jetty access road is within a narrow band of mature woodland on the north side of Laporte Road referred to as 'Long Strip'. The canopy is dominated by pedunculate oak (*Quercus robur*) and ash (*Fraxinus excelsior*), with an understorey of mature hawthorn, elder (*Sambucus nigra)* and some areas of denser bramble scrub. This habitat is representative of the UK Priority Habitat type 'lowland mixed deciduous woodland'. This habitat would fall within the 'trees and woodland' Local BAP habitat type for which an action plan has been prepared.
Ephemeral/ short perennial	Part of the East Site has previously been in use for ad-hoc overflow parking and storage of construction arisings/ equipment; the central area comprises crushed and levelled aggregate material that has become colonised with ephemeral/ short perennial vegetation. This habitat does not support a sufficiently diverse mosaic of species-rich areas, wetlands and varied topography to fall within the definition of the UK Priority Habitat type 'open mosaic habitat on previously developed land'.

Habitat	Brief Description
	The habitat is also considered insufficiently diverse to meet the Local BAP definition of 'brownfield' habitat, although there are elements of the habitat that may be considered representative of this habitat type such as the bare ground/ loose substrates that are becoming colonized by vegetation.
Ditches	There are a number of ditches within the West Site; some are of recent origin having been constructed approximately five years ago as part of development enabling works for access to the land off Kings Road. There are a number of other ditches in the West Site associated with the overgrown hedgerows that formerly marked the field boundaries. All of the ditches are heavily overgrown with common reed and hold virtually no water. There is a drainage ditch that runs along the western boundary of Long Strip Woodland, and which is culverted beneath Laporte Road. The stretch south of Laporte Road, and approximately three quarters of the ditch north of Laporte Road was dry when surveyed in Spring and supported no evidence of aquatic/ marginal vegetation so is unlikely to regularly hold water. The northernmost section held some water, but supported no vegetation due to substantial shading from shrubs on the banks. A large man-made drainage ditch is present at the base of the flood embankment; this is regularly maintained by the Environment Agency. The ditch is approximately 5m wide and supports areas of dense common reed. North Beck Drain flows north to south adjacent to the eastern boundary of the temporary compound off Laporte Road.
Ponds	There are no ponds within the Site boundary. Three ponds were identified through desk study as present within 250m of the Site boundary. These are discussed in further detail below in respect of their potential to support great crested newt.

Badger

8.6.10 The desk study returned no records of badger from within the Desk Study Area.

8.6.11 No field signs indicating the presence of badger were found within the Site boundary during surveys undertaken in 2022. There is some potentially suitable habitat in grassland, woodland and areas of scrub for foraging and commuting badgers, but these habitats are not well connected to suitable habitat for badgers in the wider local area. Within the Site boundary, the woodland habitat in Long Strip offered the highest potentially suitable habitat for badgers; however, the woodland is relatively heavily disturbed by pedestrians/ dog walkers (there is a public bridleway along the eastern edge of the woodland) with evidence of fly-tipping within the woodland area, and no signs of badger were found.

8.6.12 Although it is difficult to confirm the absence of this species from areas where survey has not been possible to date, given that it is a common, widespread and wide-ranging mammal, given the lack of desk study records and the lack of field evidence, the presence of badger on anything other than a transient and occasional basis within the Site boundary is unlikely. This species is therefore not considered further in this assessment.

8.6.13 Precautionary mitigation would be implemented during the Project construction phase to address the low residual risk of encountering badger during clearance activities.

Bats

8.6.14 The desk study returned no records of bats from within the Desk Study Area.

8.6.15 Most habitats within the Site boundary are of low quality for foraging/ commuting bats due to the open nature of the land and the lack of botanical species diversity to provide large numbers of insect prey. These habitats were not scoped into the survey for foraging bats.

8.6.16 The woodland habitat in Long Strip offers the highest potentially suitable habitat for foraging and commuting bats; however, surveys completed to date have only recorded common pipistrelle (*Pipistrellus pipistrellus*) during both the walked transects and the static remote detector deployment periods. It is concluded that the relative isolation of the woodland habitat from other suitable areas of scrub/ woodland in the wider local area due to the operational port and other industrial uses, results in low numbers of bats being present.

8.6.17 The walked transects also covered the young woodland/ scrub habitat in the East Site due to its connectivity to Long Strip woodland, but again the surveys undertaken to date indicate the presence of only low numbers of common species foraging/ commuting within the habitats.

8.6.18 It is evaluated that the habitats within the Order Limit are of Site value to foraging and commuting bats. A bat survey report will be prepared and submitted as a technical appendix to the nature conservation (terrestrial ecology) chapter of the ES. To address the query raised in the Scoping Opinion regarding the potential for bats to be roosting in trees within Long Strip, the bat survey report will also include information on the suitability of trees likely to be impacted in Long Strip for roosting bats.

Otter

8.6.19 The desk study returned one recent record of otter within the Desk Study Area (location withheld). Otter surveys of the West Site in 2011 and 2013 (excluding the newer ditches around the new road infrastructure, which had not been created at that time) for a previous planning application (North East Lincolnshire Council planning reference DM/1027/13/OUT) did not record any evidence of this species.

8.6.20 It is possible that otters visit habitats within the Site boundary as a place for rest or shelter given that they are likely present in the nearby Humber Estuary, but no sign of their presence or suitable breeding features were identified within terrestrial habitats closest to the estuary (e.g. Long Strip woodland). The large ditch at the base of the flood embankment has the potential to provide foraging habitat for otter (particularly given its proximity and connectivity to the estuary) although no signs of otter were recorded during a survey undertaken in October 2022.

8.6.21 North Beck Drain, which runs along the eastern boundary of the temporary compound off Laporte Road, also provides suitable foraging and resting habitat for otter. This watercourse was not surveyed for otter as it is outside the Site boundary and will not be directly impacted.

8.6.22 All the other ditches within the Site boundary are considered unsuitable for otter. The ditches within the West Site (both the ditches associated with the original hedgerow boundaries, and those created in recent years as part of the consented development enabling works) are shallow and likely to be predominantly dry most of the time (due to being heavily overgrown with common reed) and therefore would not be expected to support sufficient fish to provide prey for foraging otter. The West Site is surrounded by roads and otters are vulnerable to road traffic injury or fatality, therefore reducing the likelihood of otter being present. No evidence of otter was recorded on these ditches during an otter survey undertaken in October 2022, and it is concluded that the species is likely absent from these parts of the Site boundary.

8.6.23 Despite the lack of otter field signs recorded during an otter survey of ditches within the Site boundary undertaken in October 2022, given the recorded presence of otter in the Desk Study Area, it is reasonable to conclude that this species will likely use suitable habitats within and adjacent to the Site boundary on occasion for foraging and passage. This includes North Beck Drain and the large ditch at the base of the flood embankment, as well as the estuary frontage/ intertidal mudflats. This is a wide-ranging species that is likely to be found in suitable habitats throughout the Humber catchment, and it is therefore evaluated that these habitats within the Site boundary are of Local value to populations of otter. An otter survey report will be prepared and submitted as a technical appendix to the nature conservation (terrestrial ecology) chapter of the ES.

Water Vole

8.6.24 The desk study returned two recent records of water vole within the Desk Study Area, the closest of which was associated with a ditch on the north side of Kings Road approximately 55m north of the Site boundary (West Site).

8.6.25 The LWS citation for Laporte Road Brownfield Site LWS refers to a "*thriving population*" of water vole in North Beck Drain[1].

8.6.26 Water vole surveys of the ditches on the West Site in 2011 and 2013 (excluding the newer ditches around the new road infrastructure, which had not been created at that time) conducted for a previous planning application (North East Lincolnshire Council planning reference DM/1027/13/OUT) did not record any evidence of this species.

[1] The LWS was originally surveyed by the local nature partnership in August 2008, and was most recently surveyed in May 2015 – it is not stated in the LWS citation on which survey the water vole population was identified.

8.6.27 North Beck Drain, which runs along the eastern boundary of the temporary compound off Laporte Road, provides suitable potential habitat for water vole, and it is noted from the desk study that the species has previously been reported from this drain. This drain was not accessible for the water vole survey undertaken in October 2022; however it will not be directly impacted by the Project.

8.6.28 The large ditch at the base of the flood embankment has the potential to provide habitat for water vole and has habitat connectivity via the drainage network to North Beck Drain, which has previously been recorded to support water vole. This ditch was surveyed for water vole in October 2022, and evidence of this species was confirmed.

8.6.29 All the other ditches within the Site boundary are considered unsuitable for water vole. The ditches within the West Site (both the ditches associated with the original hedgerow boundaries, and those created in recent years as part of the consented development enabling works) are shallow and likely to be predominantly dry most of the time (due to being heavily overgrown with common reed) and therefore would not be expected to support water vole. The ditches were surveyed for water vole in May 2022 and no evidence of water vole was found. These ditches were re-surveyed for water vole in October 2022 and no evidence of the species was found. It is therefore concluded that the species is likely absent from these ditches and they are not considered further in respect of this species.

8.6.30 Surveys undertaken in 2022 recorded water vole field signs on the large ditch at the base of the flood embankment. Given that there are desk study records of water vole on North Beck Drain, and the watercourse is connected to the ditch referred to above, it is reasonable to conclude that it also supports this species. Water vole is listed on the Local BAP as 'widespread' within the county, which is noted to be a population stronghold within the UK despite the national trend for a significant decline in this species. It is therefore evaluated that the water vole population is of County nature conservation value. A water vole survey report will be prepared and submitted as a technical appendix to the nature conservation (terrestrial ecology) chapter of the ES.

Great Crested Newt

8.6.31 The desk study returned no recent records of great crested newt within the Desk Study Area. Surveys of the wetland complex in the adjacent landfill site (Pond 3) conducted in 2011 and 2013 for a planning application (North East Lincolnshire Council planning reference DM/1027/13/OUT) did not record great crested newt.

8.6.32 There are no ponds within the Site boundary. Three ponds have been identified within 250m of the Site boundary, and these are considered in further detail below:

a. Pond 1 (TA 211 155) – approximately 10m from Site boundary - this is a large fire water storage lagoon within the Associated Petroleum Terminal, which lies to the immediate west of the jetty landfall site. The pond was not accessible for survey, but was viewed from the public footpath along the flood embankment. The pond appears to be partially shaded by woodland

along the southern margins and supports stands of common reed to its margins.

b. Pond 2 (TA 210 154) – approximately 95m from the Site boundary - this is square lagoon within the Associated Petroleum Terminal. The pond was not accessible for survey or visible from publicly accessible land. The pond appears from aerial photographs to be heavily overgrown with little open water.

c. Pond 3 (TA 198 141) – approximately 100m from Site boundary - this is a complex of ponds used for drainage within the landfill site that lies to the south of West Site. It is assumed that the waterbodies are relatively transient due to the nature of the site, resulting in change/ disturbance to their location and extent. The ponds were not accessible for survey. As great crested newt was not recorded in previous surveys, and there are major barriers[2] to great crested newt dispersal onto the landfill site, there is no reasonable likelihood of great crested newt being present at this location.

8.6.33 The large drainage ditch at the base of the flood embankment was considered to represent potentially suitable habitat for great crested newt, although saline influences could not be ruled out given its proximity to the estuary and its potential interactions with the marine environment. The ditch was subject to eDNA sampling in June 2022, which returned an 'inconclusive' result, which is often a result of chemical contamination of a watercourse. It is concluded that this habitat is likely unsuitable for great crested newt given its likely contamination and saline influence, and therefore it is not considered further in the assessment.

8.6.34 The other drainage ditches within the Site boundary are subject to seasonal fluctuations in water levels and have been observed during the course of other surveys to regularly dry out in the Spring/ early Summer. They are therefore unsuitable for breeding great crested newt because they do not regularly hold sufficient water or aquatic vegetation to enable successful breeding activity (the larvae of this species are entirely aquatic until late Summer).

8.6.35 There remains the potential for great crested newt to be present in Ponds 1 and 2. However, given the lack of recorded great crested newt populations in the wider local area (within 1km), and the lack of any other ponds within 500m of Ponds 1 and 2 from which the species could potentially have colonised these man-made ponds since they were constructed for the petroleum terminal in the 1960s, it is considered unlikely that they will be present. However, The Applicant

[2] The following constitute major barriers to dispersal and are unlikely to be traversed by great crested newts: rivers and larger streams; main roads such as A-roads, motorways or any other road with high traffic volume (i.e. high traffic volume during the night when great crested newt are more likely to be dispersing/ commuting); and major urban infrastructure including extensive areas of hardstanding and buildings and dense networks of minor roads with little green space.

will seek access to these waterbodies for survey in Spring 2023 and the results of any surveys will be reported in the ES.

Terrestrial Invertebrates

8.6.36 The desk study returned ten recent records of notable species including the white-letter hairstreak butterfly (*Satyrium w-album*), which is a UK Priority Species.

8.6.37 Elm (*Ulmus* spp.) the larval foodplant of white-letter hairstreak was not recorded within or adjacent to the Site, and it is concluded that this species is likely to be absent.

8.6.38 A walkover of the habitats within the Site boundary was undertaken by a terrestrial invertebrate specialist in July 2022 and concluded that the habitats were unsuitable to support any significant populations of rare and/ or notable terrestrial invertebrate species.

8.6.39 It is concluded that the habitats within the Site boundary are of Site value only to terrestrial invertebrate species, and further detailed invertebrate surveys of the habitats are not merited. No further consideration is therefore given to terrestrial invertebrates in this assessment.

Protected Species Summary

8.6.40 A summary of the protected species surveys undertaken to date and the results obtained are presented in **Table 8.5**.

Baseline reports for each species will be prepared as technical appendices to the ES.

Table 8.5: Protected Species Summary and Evaluation

Species	Desk Study Records	Field Survey Result	Evaluation of Nature Conservation Value	Scoped into Assessment?
Badger	No records from study area.	• No evidence of badger presence. • May be present on transient and occasional basis.	Site	No
Bats	No records from study area.	• Majority of habitats are of low quality for foraging/ commuting bats due to the open nature of the land and the lack of botanical species diversity to provide large numbers of insect prey. • Long Strip woodland is of slightly higher value to foraging/ commuting bats as it provides a sheltered habitat corridor. It might also be utilised by roosting bats.	Site	Yes
Otter	One record in study area	• No evidence of this species recorded during survey.	Local	Yes

Species	Desk Study Records	Field Survey Result	Evaluation of Nature Conservation Value	Scoped into Assessment?
	(location withheld). Likely to be present in Humber Estuary.	• Otter assumed likely present occasionally foraging/ on passage on North Beck Drain and ditch at base of flood embankment, as well as along estuary frontage. • All other ditches unsuitable for otter, and no evidence of the species was recorded during surveys.		
Water vole	One record from Kings Road area approximately 55m from the Site boundary.	• Water vole presence confirmed on ditch at base of flood embankment, and likely on North Beck Drain. • All other ditches unsuitable for water vole, and no evidence of the species was recorded during surveys.	County	Yes
Great Crested Newt	No records within study area.	• No ponds within Site boundary. • Ponds 1 and 2 within 250m were not accessible for survey. • Pond 3 (wetland complex in landfill site) was not accessible for survey but was surveyed in 2011 and 2013 and great crested newt was not recorded. • Most ditches within Site boundary are regularly dry in late Spring and are therefore unsuitable for breeding great crested newt. • Species considered likely absent based on previous negative survey results and lack of desk study records.	Not applicable – likely to be absent	Not applicable – likely to be absent
Terrestrial invertebrates	Ten recent records of notable species including white-letter hairstreak.	• Habitats considered to be of low importance for terrestrial invertebrates.	Site	No

Invasive Non-native Plants

8.6.41 No non-native invasive plant species were recorded within the Site boundary.

Future Baseline

8.6.42 In the short term, in the absence of the Project, and assuming a continuation of port operations associated with the Queens Road and Laporte Road sites, it is concluded that the limited suite of semi-natural habitats recorded would not change significantly. It is therefore reasonable to conclude that there would

continue to be negligible potential for protected species to occur within that part of the Project footprint.

8.6.43 In the medium to long term, in the absence of the Project and other development, the habitats within the West Site would be expected to become further overgrown and encroached by the invading willow scrub, reducing the prevalence of grassland habitat. These habitats may provide additional nesting opportunities for breeding birds, and in time, roosting opportunities for bats.

8.6.44 Similarly, in the absence of the Project within the East Site, pioneer vegetation communities on the bare substrate areas would become further established and could increase its ecological value in terms of the niches and habitats provided for botanical species and invertebrates. Over an approximate 5 to 15 year timeframe, it is reasonable to assume that a mosaic of habitats may become sufficiently well established to meet all the criteria for open mosaic habitat (OMH) UK Priority Habitat or have otherwise been replaced by other habitat types e.g. loss to scrub invasion. Similarly, areas of scrub and trees would mature further and may provide additional nesting opportunities for breeding birds and roosting opportunities for bats.

8.6.45 The woodland within Long Strip is not expected to change significantly over the short-medium term in the absence of the Project, as it is not subject to any substantial management/ commercial timber extraction. Biodiversity enhancement works have taken place previously and maintenance is undertaken as required to maintain clear access to the bridleway. Given the presence of mature ash, it is at potential risk of losing specimens to ash dieback disease, which is spreading in the UK. This may result in the loss of some specimens and an opening up of the canopy layer, which may encourage the development of more diverse ground flora species. The presence of additional deadwood may also attract a greater diversity of terrestrial invertebrates and fungi to increase the biodiversity of the woodland.

8.6.46 The continuation of agricultural cultivation of the arable field north of Laporte Road is not anticipated to result in any changes to the ecological baseline of the habitats.

8.7 Development Design and Impact Avoidance

Embedded Mitigation Measures

8.7.1 The Project has been designed, as far as possible, to avoid and minimise impacts and effects to terrestrial ecology through the process of design development, and by embedding mitigation measures into the design.

8.7.2 The provision of landscape planting to integrate biodiversity features will be considered although onsite opportunities would be very limited. Further consideration will be given to this in the ES.

8.7.3 The Project design aims to minimise lighting impacts beyond the Site boundary, for example by directing lighting away from adjacent habitats. This will be in accordance with a lighting design for the Project that will be set out in an Indicative Lighting Strategy.

8.7.4 Surface water discharge at the operational Site would be likely attenuated to green-field run-off rates and therefore there would be unlikely to be any changes in the flow rates within the adjacent drainage ditches. However, once the drainage options are fully identified, any potential for adverse operational effects on the ditch habitats and the protected species that they may support (otter and water vole) will be assessed in the ES.

8.7.5 Where necessary and following completion of field surveys, mitigation for protected species to ensure legislative compliance would be identified and set out in the ES.

8.7.6 The predicted loss of woodland within the Long Strip would require compensatory measures to be agreed with the local planning authority. Policy 41 (1D) of the North East Lincolnshire Local Plan 2018 states that the council will seek to specifically "*minimise the loss of biodiversity features, or where loss is unavoidable and justified ensure appropriate mitigation and compensation measures are provided*".

8.7.7 Opportunities to meet the planning policy and legislative requirements in respect of biodiversity enhancement will be explored as the Project design progresses.

Standard Mitigation Measures

8.7.8 Construction of the Project would be subject to measures and procedures defined within a Construction Environmental Management Plan (CEMP), which would be produced prior to the commencement of construction by the Principal Contractor and would be based on, and incorporate, the contents and requirements of the outline Construction Environmental Management Plan (CEMP) which will be submitted with the DCO Application.

8.7.9 The CEMP would include measures for prevention of surface and ground water pollution, fugitive dust management and noise prevention or amelioration. Measures to be included in the CEMP include the following:

a. An Environmental or Ecological Clerk of Works (ECoW) would be present during construction as appropriate to oversee implementation of impact avoidance commitments.

b. Precautionary working methods would be adopted to manage any residual risk of protected species being encountered e.g. reptiles, and a Precautionary Working Method Statement (PWMS) would be prepared as part of the CEMP.

c. Precautionary measures would be implemented to prevent trapping wildlife in construction excavations, in order to ensure compliance with animal welfare legislation. Any excavations would be covered overnight, or where this is not practicable, a means of escape would be fitted (e.g. battered soil slope or scaffold plank situated at or below a 45 degree angle), to allow animals (e.g. otter, badger, hedgehog, amphibians) to vacate excavations should they fall in.

d. Construction temporary lighting would be arranged so that glare would be minimised outside the construction site. Measures to minimise the impact of construction lighting would be detailed in the CEMP.

8.7.10 Where mature trees within the Long Strip woodland would be impacted, further inspections and where necessary surveys, would be undertaken prior to any tree felling. Where bat roosts are confirmed as present and cannot be reasonably avoided, an appropriate Natural England European Protected Species Mitigation (EPSM) licensing route would be adopted. This would either be a Project specific EPSM licence or supervision of tree removal by a Bat Class Licenced ecologist, depending on the nature of the roost identified.

8.7.11 Decommissioning would apply to the landside elements of the Project and would be undertaken safely, in line with environmental legislation at the time of the works. The required licences and permits would also be acquired. Decommissioning of the landside elements of the Project would likely involve leaving underground pipelines in situ and making them safe. All above ground infrastructure associated with the Project would likely be dismantled and all materials removed. Land would be restored to a satisfactory state.

8.7.12 An outline Decommissioning Environmental Management Plan (DEMP) will be produced and submitted with the DCO application – this will detail measures envisaged to be implemented to avoid or reduce impacts during the decommissioning of the landside elements. Details will be included within the ES. At the appropriate point in time, a detailed Decommissioning Plan would be developed by the Applicant in accordance with the outline DEMP, which would address the relevant statutory requirements at the time; address any extant commitments with landowners/ statutory authorities; and take account of any developed technology and good practice.

8.8 Potential Impacts and Effects

8.8.1 The preliminary assessment has identified that construction, operation and decommissioning of the Project has the potential to result in adverse effects on terrestrial ecology.

8.8.2 This section describes the potential impacts and effects during the construction, operation and decommissioning of the Project on relevant ecological features that can reasonably be identified at this preliminary stage.

8.8.3 To enable focussed impact assessment, only impact pathways that have the potential to result in significant effects on ecological features have been screened into the preliminary impact assessment. Those impacts that are considered unlikely to result in significant effects are scoped out and not considered further herein.

8.8.4 The preliminary assessment considers development design and mandatory and committed impact avoidance measures as set out in **Section 8.4.**

8.8.5 Given that the Project design details are subject to development, the scope of the ecological impact assessment has been identified taking a precautionary (worst case) assessment of impacts.

Construction

8.8.6 The following section provides a preliminary assessment of the potential construction impact pathways on nature conservation (terrestrial ecology). The following pathways have been scoped into the impact assessment:

a. Loss of woodland habitat within Long Strip (Borough nature conservation value);

b. Loss of bat roosts (Site nature conservation value);

c. Noise/ visual disturbance to otter (Local nature conservation value); and

d. Damage/ loss of habitat supporting water vole and noise/ visual disturbance (County nature conservation value).

Loss of Woodland Habitat

8.8.7 Based on the current Project layout, construction of the pipeline from the jetty (and associated maintenance access track/ wayleave) and a new access road to the jetty would result in direct impacts on Long Strip woodland (the section on the north side of Laporte Road), a mature semi-natural woodland of Borough nature conservation value. At present, construction requirements are uncertain, although the aim would be to minimise the construction footprint and permanent land take as far as practicable (refer to the description of the Project in **Chapter 2: The Project**. Regardless of the scale of impact, the impact on the woodland would result in a likely conflict with Local Planning Policy 41, which states that the council will seek to minimise the loss of biodiversity features, in the absence of appropriate mitigation/ compensation.

8.8.8 Given current uncertainties over construction requirements, it is not possible to quantify the exact scale of woodland loss within the Long Strip at this stage, but it is expected to be a large part of the woodland. It is however anticipated that some woodland will be retained along the eastern edge. This tree loss would have a large impact on the woodland and the local network of green infrastructure. Mature deciduous woodland is already reduced in extent and fragmented in the county due to the predominance of agricultural cultivation. Further, in this part of North East Lincolnshire there is very little woodland present due to the presence of the operational port of Immingham and the surrounding industrial land use.

8.8.9 Dependent on the alignment of the pipeline and access road there could also be a severance impact on the woodland, with an adverse effect on the integrity of the remaining woodland area. Reduction in the woodland size could also expose it to increased impacts from adjacent land-use e.g. agricultural inputs (both biocides and/ or nutrient enrichment) from neighbouring fields, which could affect a greater proportion of the remaining woodland, leading to changes in woodland composition and structure.

8.8.10 The permanent loss of woodland of this age and structure could not be compensated over the short to medium term. Instead, compensation would require a timeframe longer than the proposed 25-year operational life of the Project. So, the effect would be permanent for the purposes of this assessment.

8.8.11 Pending further Project design and further impact assessment, the precautionary principle indicates potential for construction of the pipeline and jetty access track to compromise the structure and function and/ or conservation status of Long Strip woodland. Therefore, the effect is assessed as meaningful at the Borough level and is therefore defined as moderate adverse (**significant**).

Loss of Bat Roosts

8.8.12 It is not known whether the above woodland habitat loss would also result in impacts to bat roosts. Pending further survey to resolve this, it is assumed that some of the trees present could be suitable for use by roosting bats. However, the very limited bat activity recorded during the bat foraging surveys indicates that if roosts are present, they are only likely to be used by small numbers of common bat species i.e. relatively low value roost types (Site value) that could be readily compensated through standard good practice embedded mitigation. However, in the absence of mitigation, it is assessed that the loss of trees supporting a small number of common species of roosting bats of Site value would be minor adverse (**not significant**).

Noise/ Visual Disturbance to Otter

8.8.13 Otter is likely to be present on North Beck Drain and the ditch at the base of the flood embankment and which may be affected by noise and visual disturbance arising from Project construction. If this disturbance affects locations used as resting places, then this would result in potential conflicts with legal protections under The Conservation of Habitats and Species Regulations 2017 (as amended). However, this would depend on the magnitude and duration of the disturbance impact as the legislation only relates to levels of disturbance likely to have an adverse impact on the conservation status of the species.

8.8.14 Otter is wide-ranging species that is likely to be found in suitable habitats throughout the Humber catchment. Therefore, it is not likely to be specifically dependent, for resting or foraging, on the North Beck Drain and/or the ditch i.e. these habitats are of up to Local value. Even if present, there is likely to remain sufficient unaffected habitat for otter within its wider territory. Applying the precautionary principle, the effect is assessed as meaningful at the Local level and is therefore assessed as minor adverse (**not significant**).

Damage/ Loss of Habitat Supporting Water Vole, and Related Construction Disturbance

8.8.15 This species is present on the ditch at the base of the flood embankment and riparian habitats supporting this species may be directly impacted by Project construction activities for the pipeline and jetty access track, which require crossing of this ditch and a potential new culvert to replace the existing culvert.

8.8.16 However, direct habitat impacts would likely be minor in extent and not affect large areas of habitat. There could also be indirect impacts on habitats e.g. construction works may temporarily reduce the water supply to ditches leading to the drying out of ditch habitat, and noise and visual disturbance to water voles.

However, these impacts are only likely to displace a small number of individual water voles within the impacted section of the ditch, and not the entire population.

8.8.17 North Beck Drain is also likely to support water vole given the habitat connectivity to the ditch at the base of the flood embankment. However, this watercourse will not be directly affected by construction activities within the temporary construction compound off Laporte Road, which borders the watercourse. Standard mitigation during construction will ensure there is no pollution to the watercourses, and will be incorporated into the CEMP. As a result of the flood embankment at this location, there is also a substantial buffer zone between the watercourse and the construction compound, and therefore it is not considered that there is any potential for indirect effects on water vole e.g. due to noise and visual impacts during construction.

8.8.18 Applying the precautionary principle, the effect is assessed as meaningful at the County level and is assessed as minor adverse (**not significant**).

Impact Pathways Scoped Out

8.8.19 The following impact pathways during Project construction have been scoped out of the preliminary assessment:

a. Loss of habitats other than woodland – all other habitats within the Site boundary are of Site nature conservation value only and are not relevant ecological features for the purposes of ecological impact assessment.

b. Lighting disturbance/ disruption to foraging bats – the impacted habitats are used by very low numbers of foraging bats, which are evaluated to be of Site nature conservation value only and are therefore not relevant ecological features for the purposes of ecological impact assessment.

c. Dust emissions – standard measures to control fugitive dust emissions would be incorporated into the CEMP for legislative compliance and therefore there would be no potential for dust smothering to adjacent higher value habitats within Laporte Road Brownfield Site LWS.

d. Road traffic emissions – the predicted number of construction vehicle movements is lower than the Institute of Air Quality Management (IAQM) and Environmental Protection UK (EPUK) screening guidance (see **Chapter 6: Air Quality**), below which a road traffic impact is unlikely to contribute to a significant effect on local air quality.

e. Surface water pollution – standard measures to control surface water run-off during construction would be incorporated into the CEMP for legislative compliance and therefore there would be no potential for pollution to impact adjacent higher value habitats such as North Beck Drain and Laporte Road Brownfield Site LWS.

Operation

8.8.20 The following section provides a preliminary assessment of the potential operational impact pathways on nature conservation (terrestrial ecology). The following pathways have been scoped into the impact assessment:

a. Lighting disturbance to foraging bats (Site nature conservation value).
b. Noise/ visual disturbance to otter (Local nature conservation value).
c. Noise/ visual disturbance to water vole (County nature conservation value).

Lighting Impacts on Foraging Bats

8.8.21 Operation of the Project requires new external lighting at the East and West Sites. Operational lighting can be detrimental for bats if poorly designed and located in proximity to habitats of importance for bats e.g. important foraging habitats or movement corridors providing access to important foraging habitats. Light spill and glare can deter bats from accessing affected preferred habitats, and by so doing force bats to use habitats that are less suitable for foraging or expend more energy to go around the lit areas to access foraging habitats.

8.8.22 Given the existing very low levels of bat activity, the habitats present are of Site value only for bats. Further, there is a commitment to sensitive design of external artificial lighting. Accordingly, there is no reasonable likelihood of an impact on the conservation status of bats as a result of operational lighting.

8.8.23 Applying the precautionary principle and taking into account the embedded mitigation for sensitive lighting design, the effect is assessed as meaningful at the Site level and is therefore assessed as minor adverse (**not significant**).

Noise/ visual Disturbance to Otter

8.8.24 Routine operational activities are not likely to disturb the Otter. Otter is regularly encountered in association with urban watercourses and areas of industrial activity, indicating that once the peak disturbance arising from construction is completed, otter is likely to habituate to operational regimes. It is therefore assessed that this will result in a negligible effect on otter (**not significant**).

Noise/ Visual Disturbance to Water Vole

8.8.25 The rationale for otter is equally applicable to water vole. This species is likely to occur if suitable habitats are present regardless of operational activities on adjacent land. Even if there is operational disturbance in the vicinity of the jetty/ pipeline/ access track at levels that could disturb water voles, this has the potential to result in only very localised disturbance/ displacement of water voles from the eastern end of the ditch at the base of the flood embankment. This would reasonably only impact single numbers of water voles, and it is reasonable to assume that there is sufficient habitat adjacent to the east (on the same ditch) and further east associated with North Beck Drain, to accommodate any individual water voles displaced from the short section within the vicinity of the operational area. It is therefore assessed that this will result in a minor adverse on water vole (**not significant**).

Impact pathways Scoped Out

8.8.26 The following pathways during Project operation have been scoped out of the preliminary assessment:

a. Road traffic emissions – the predicted number of operational vehicle movements is lower than the IAQM and EPUK screening guidance (see **Chapter 6: Air Quality**), below which a road traffic impact is unlikely to contribute to a significant effect on local air quality.

b. Surface water pollution – standard measures to control surface water run-off during operation are embedded within the Project design for legislative compliance, and therefore there would be no potential for pollution to impact adjacent higher value habitats such as North Beck Drain and Laporte Road Brownfield Site LWS.

Decommissioning

8.8.27 The likely impacts arising from Project decommissioning would be of similar magnitude and scale to those described for the construction phase, with the exception that no further woodland loss would be required, although some woodland vegetation may need to be cut back to permit access to remove infrastructure.

8.8.28 The potential for adverse decommissioning impacts and effects on habitats and species would be limited by the nature of the proposed decommissioning activities. It is assumed that decommissioning would remove all above ground infrastructure and that buried pipelines etc would be made safe and left in situ. Therefore, there would be no requirement to remove or disturb habitats to remove buried infrastructure, and no species associated with these habitats would be affected.

8.8.29 On this basis, there are no likely significant effects on terrestrial ecology anticipated as a result of the Project decommissioning.

8.9 Mitigation and Enhancement Measures

Loss of Woodland Habitat

8.9.1 In order to mitigate for tree loss from the Long Strip and elsewhere, the following approach is proposed:

a. Tree planting within some peripheral areas around the operational sites of the hydrogen production facility, although again these opportunities will be very limited; and

b. Opportunities to be explored for potential off-site tree-planting within areas to be agreed with local bodies/organisations.

8.9.2 A habitat compensation strategy will need to be agreed with the local planning authority to ensure compliance with Local Planning Policy 41, which states that the council will seek to *"..minimise the loss of biodiversity features, or where loss is unavoidable and justified ensure appropriate mitigation and compensation measures are provided*..".

8.9.3 Mitigation will be implemented during construction to ensure the protection of retained trees with appropriate root protection areas, and these will be clearly marked in the CEMP.

Loss of Bat Roosts

8.9.4 Should a bat roost(s) be identified in trees to be lost/ damaged in Long Strip woodland, a European Protected Species Mitigation (EPSM) licence would be needed from Natural England to ensure compliance with the Habitats Regulations to permit the loss of a roost(s). However, it is reasonable to assume that a licence would be granted by Natural England for low value roosts i.e. those used by small numbers of common species of bats. Standard mitigation would be employed during the construction phase as necessary to meet the terms of the EPSM licence e.g. tree removal in the winter months (which would also be required as standard mitigation for breeding birds).

Damage/ Loss of Habitat Supporting Water Vole

8.9.5 A licence to damage/ disturb water vole habitat will be required from Natural England for works to the drainage ditch at the base of the flood embankment. Given the limited extent of the works (<50 m of ditch bank affected), it is considered that the activities would fall within the remit of undertaking works under the supervision of an ecologist with a Natural England Class Licence.

8.9.6 This requires appropriate seasonal timing of habitat clearance works to displace water voles prior to damage/ destruction of habitats, and as such initial vegetation clearance works would be limited to the period 15 February to 15 April. Subsequent works to maintain the cleared area can be undertaken after this initial seasonally restricted clearance period to ensure the habitats remain unsuitable for water vole prior to the commencement of construction. Construction works to the ditch are not seasonally constrained following the completion of the initial vegetation clearance works under the Class Licence, assuming the banks are maintained as unsuitable for water vole in the period between the initial clearance and the commencement of construction activities at this location.

8.9.7 A water vole method statement would be prepared as part of the CEMP.

8.10 Preliminary Assessment of Residual Effects

Construction

Loss of Woodland Habitat

8.10.1 The permanent loss of woodland of this age and structure could not be compensated over the short to medium term. Instead, compensation would require a timeframe longer than the proposed 25-year operational life of the Project. So, the loss of habitat would be permanent for the purposes of this assessment even with compensation. It is therefore assessed that the residual effect remains moderate adverse (**significant**).

Loss of Bat Roosts

8.10.2 The requirement for an EPSM licence would provide a legally enforceable mechanism to ensure that there is no significant adverse effect on bat populations. The required mitigation under this licence would involve routine measures that can be expected to be successful.

8.10.3 On this basis, given legal requirements would need to be and can be met, the potential residual effect on roosting bats is precautionarily assessed as remaining as minor adverse (**not significant**). This is on the basis that the mitigation strategy will ensure compliance with UK Wildlife Legislation but will not reduce the magnitude or severity of the impact on individual roosting bats.

Noise/ Visual Disturbance to Otter

8.10.4 No mitigation requirements have been identified. The residual effect on otter is therefore assessed as meaningful at the Local level and is minor adverse (**not significant**).

Damage/ Loss of Habitat Supporting Water Vole, and Related Construction Disturbance

8.10.5 The requirement for a Natural England licence would provide a legally enforceable mechanism to ensure that there is no significant adverse effect on water vole populations. The required mitigation under this licence would involve routine measures that can be expected to be successful.

8.10.6 On this basis, given legal requirements would need to be and can be met, the potential residual effect on the conservation status of water voles is precautionarily assessed as remaining as minor adverse (**not significant**). This is on the basis that the mitigation strategy will ensure compliance with UK Wildlife Legislation but will not reduce the magnitude or severity of the impact on individual water voles.

Operation and Decommissioning

8.10.7 No residual operational or decommissioning effects on terrestrial ecology receptors are predicted.

8.11 Summary of Preliminary Assessment

8.11.1 **Table 8.6** provides a summary of the likely significant terrestrial ecology effects associated with the Project.

8.11.2 This preliminary assessment identifies limited potential for significant adverse effects on terrestrial ecology features. This is because the Project generally coincides with land of low biodiversity value, and consequently there is (a) little potential for protected and notable species to occur, and (b) surveys have concluded the minimal presence or likely absence of such species

8.11.3 Only one potentially significant (moderate adverse) terrestrial ecology effect is predicted based on current information regarding Project construction and design layout. This relates to the permanent loss of UK Priority deciduous woodland habitat during Project construction as a result of the routing of the pipeline and jetty access road through Long Strip woodland. This impact would result in a potential conflict with planning policy, as well as being adverse for nature conservation at the Borough level. The loss of parts of this mature woodland, if it cannot be avoided, would need to be compensated. However, full compensation would not be achieved over the operational life of the terrestrial elements of the

Project (the hydrogen production facility), so the residual effect would remain significant over the long term.

8.11.4 No other likely significant effects on designated nature conservation sites, habitats or species are predicted during Project construction, operation or decommissioning.

Table 8.6: Summary of Preliminary Assessment – Potential Likely Significant Effects

Receptor	Impact Pathway	Potential Effect Significance	Mitigation Measures	Potential Residual Effect	Confidence
Construction Phase					
Mature deciduous woodland	Pipeline and jetty access road construction resulting in loss of/ damage to woodland habitat	Significant	Compensation for loss of/ damage to woodland habitat to be agreed with the local planning authority where it cannot be reasonably avoided.	Significant	High
Bat roosts	Loss of minor tree roosts (if present) during pipeline construction	Not significant	Micro-siting options to be considered to avoid roost loss. EPSM licence if roost loss cannot be avoided.	Not significant	High
Otter (foraging)	Noise and visual disturbance	Not significant	Buffer zone from edge of North Beck Drain. Sensitive temporary lighting design to minimise spill (CEMP).	Not significant	High
	Changes to hydrology of ditches	Not significant	Embedded mitigation to reduce run-off to green field rates.	Not significant	High

Receptor	Impact Pathway	Potential Effect Significance	Mitigation Measures	Potential Residual Effect	Confidence
Water vole	Habitat damage/ loss	Not significant	Displacement of water voles (if confirmed present) from affected habitats under Natural England Class Licence.	Not significant	High
	Noise and visual disturbance	Not significant	Buffer zone from edges of North Beck Drain. Sensitive temporary lighting design to minimise spill.	Not significant	High
Operational Phase					
Bats (foraging)	Lighting disturbance	Not significant	Sensitive permanent lighting design to minimize spill	Not significant	High
Otter (foraging)	Noise and visual disturbance	Not significant	Buffer zone from edge of North Beck Drain. Sensitive permanent lighting design to minimise spill.	Not significant	High
Water vole	Noise and visual disturbance	Not significant	Buffer zone from edge of North Beck Drain. Sensitive permanent lighting design to minimise spill.	Not significant	High

Receptor	Impact Pathway	Potential Effect Significance	Mitigation Measures	Potential Residual Effect	Confidence
Decommissioning Phase					
Otter (foraging)	Noise and visual disturbance	Not significant	Buffer zone from edges of watercourses. Sensitive temporary lighting design to minimise spill.	Not significant	High
	Changes to hydrology of ditches	Not significant	Mitigation measures to be identified as necessary following completion of further assessment work.	Not significant	High
Water vole	Habitat damage/ loss	Not significant	Displacement of water voles (if confirmed present) from affected habitats under Natural England Class Licence.	Not significant	High
	Noise and visual disturbance	Likely not significant	Buffer zone from edges of watercourses if water voles confirmed present. Sensitive temporary lighting design to minimise spill.	Likely not significant	High

8.12 References

Ref 8-1 The Conservation of Habitats and Species Regulations 2017 (as amended) (SI 2017/1072). London: The Stationery Office.

Ref 8-2 Wildlife and Countryside Act 1981 (as amended) (SI 1981 c. 39). London: The Stationery Office.

Ref 8-3 Natural Environment and Rural Communities Act 2006 (SI 2006 c. 16). London: The Stationery Office.

Ref 8-4 Protection of Badgers Act 1992 ((SI 1992 c. 51)). London: The Stationery Office.

Ref 8-5 The Hedgerow Regulations 1997 (SI 1997/1160). London: The Stationery Office.

Ref 8-6 The Invasive Alien Species (Enforcement and Permitting) (Amendment) Order 2019 (SI 2019 No. 1213).

Ref 8-7 Department for Transport (2012) National Policy Statement for Ports. London: The Stationery Office.

Ref 8-8 Department of Energy & Climate Change (2011) Overarching National Policy Statement for Energy (EN-1). London: The Stationery Office.

Ref 8-9 Ministry of Housing, Communities & Local Government (2021) National Planning Policy Framework. London: Ministry of Housing, Communities and Local Government.

Ref 8-10 Natural England and Defra (2022) Protected Species and Development: Advice for Local Planning Authorities.

Ref 8-11 Forestry Commission and Natural England (2018). Ancient woodland, ancient trees and veteran trees: protecting them from development

Ref 8-12 North East Lincolnshire Council (2018) Local Plan 2013 to 2032 (Adopted 2018).

Ref 8-13 Lincolnshire Biodiversity Partnership (2011) Lincolnshire Biodiversity Action Plan 2011-2020 (3rd Edition). Horncastle: Lincolnshire Biodiversity Partnership.

Ref 8-14 Natural England (2022) Multi-Agency Geographic Information for the Countryside (MAGIC) website. Available online at https://magic.defra.gov.uk/

Ref 8-15 Natural England (2022) Designated site website. Available online at https://designatedsites.naturalengland.org.uk/

Ref 8-16 Joint Nature Conservation Committee (2016) Handbook for Phase 1 habitat survey – a technique for environmental audit. Peterborough: Joint Nature Conservation Committee.

Ref 8-17 Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). London: The Bat Conservation Trust.

Ref 8-18 Dean, M., Strachan, R., Gow, D. & Andrews, R., (2016) The Water Vole Mitigation Handbook. London: The Mammal Society.

Ref 8-19 Amphibian and Reptile Groups of the United Kingdom (2010) ARG UK Advice Note 5 Great Crested Newt Habitat Suitability Index. Amphibian and Reptile Groups of the United Kingdom.

8.13 Abbreviations and Glossary of Terms

Table 8.7: Glossary and Abbreviations

Term	Acronym	Meaning
Biodiversity Action Plan	BAP	A county (Lincolnshire) strategy for biodiversity conservation, defining the work needed to deliver agreed actions and targets for priority habitats and species and locally important wildlife and sites.
Construction Environmental Management Plan	CEMP	A Construction Environmental Management Plan describes the specific mitigation measures to be followed by the appointed construction contractor to reduce potential environmental and nuisance impacts.
Chartered Institute of Ecology and Environmental Management	CIEEM	The professional body which represents and supports ecologists and environmental managers.
Deoxyribonucleic acid	DNA	The hereditary material (genetic code) in humans and most other organisms.
Ecological Impact Assessment	EcIA	A process of identifying, quantifying and evaluating potential effects of development-related or other proposed actions on habitats, species and ecosystems.
Environmental DNA	eDNA	Environmental DNA is DNA shed by organisms and which can be collected from environmental samples such as soil or water,. Various species can be surveyed for using eDNA based methods, but it is a particularly common method for great crested newt survey.
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
Environmental Protection UK	EPUK	Environmental Protection UK is a national charity that provides expert policy analysis

Term	Acronym	Meaning
		and advice on air quality, land quality, waste and noise.
European Marine Site	EMS	Areas at sea, partly or completely covered by tidal water, which are protected under The Conservation of Habitats and Species Regulations 2017 (as amended). These include Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).
European Protected Species Mitigation Licence	EPSM licence	A type of licence obtained from the Regulatory Authority (in England this is Natural England) if an activity is likely to affect a European Protected Species (EPS) in a manner that will result in an offence under The Conservation of Species and Habitats Regulations 2017 (as amended).
Institute of Air Quality Management	IAQM	The professional body for air quality practitioners.
Impact Risk Zone	IRZ	The Impact Risk Zones (IRZs) are a GIS tool developed by Natural England to make a rapid initial assessment of the potential risks to SSSIs posed by development proposals. They define zones around each SSSI which reflect the sensitivities of the features for which it is notified and indicate the types of development proposal which could potentially have adverse impacts. The IRZs also cover the interest features and sensitivities of European sites, which are underpinned by the SSSI designation and "Compensation Sites", which have been secured as compensation for impacts on European /Ramsar sites.
Lincolnshire Environmental Records Centre	LERC	The Lincolnshire Environmental Records Centre is a commercial data provider, providing records of protected species, habitats and sites within Lincolnshire.
Local Wildlife Site	LWS	Sites that support habitats and/or species of regional importance. They are designated by the Lincolnshire Local Sites Partnership and protected through national and local planning policy.

Term	Acronym	Meaning
Multi-Agency Geographic Information for the Countryside	MAGIC	The MAGIC website provides authoritative geographic information about the natural environment from across government. It is presented in an interactive map which can be explored using various mapping tools that are included. Natural England manages the service under the direction of a Steering Group.
Open Mosaic Habitats	OMH	This priority habitat consists of a patchwork of bare, previously disturbed ground and vegetated areas which can be in the process of changing from one vegetation type to another. Typical of this habitat are areas of grassland, tall ruderal plant species, damp areas, patches of scrub and invasive species, both native and non-native. The previous disturbance is often industrial, such as mining, although the habitat can include old quarries or building sites, areas of spoil from old coal mines, disused railway lines and urban brownfield land.
Preliminary Ecological Appraisal	PEA	The term used to describe a rapid assessment of the ecological features present, or potentially present, within a site and its surrounding area (the zone(s) of influence in relation to a specific project (usually a proposed development).
Preliminary Environmental Information	PEI	The information referred to in Part 1 of Schedule 4 of the EIA Regulations that has been reasonably compiled by the applicant and is reasonably required to assess the environmental effects of a project.

Term	Acronym	Meaning
Site of Special Scientific Interest	SSSI	Sites of Special Scientific Interest (SSSIs) are statutory nature conservation designations notified under section 28 of the Wildlife and Countryside Act (1981). They encompass areas of land and water that are considered to best represent our natural heritage in terms of their: - flora – i.e. plants - fauna – i.e. animals - geology – i.e. rocks - geomorphology – i.e. landforms - a mixture of these natural feature
Special Area of Conservation	SAC	Sites designated under The Conservation of Habitats and Species Regulations 2017 (as amended) for the protection of habitats and species populations considered to be of international (European) importance.
Special Protection Area	SPA	Sites designated under The Conservation of Habitats and Species Regulations 2017 (as amended) for the protection of bird populations of international (European) importance.
Tree Preservation Order	TPO	An order made by a local planning authority, under the Town and Country Planning Act 1990, in respect of trees or woodlands, The principal effect of a tree preservation order is to prohibit the cutting down, uprooting, topping, lopping, wilful damage or wilful destruction of trees without the local planning authority's consent.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 9: Nature Conservation (Marine Ecology)

Associated British Ports

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Table of contents

Chapter Pages

Tables

Appendices

Appendix 9.A: Benthic Survey Report (PEI Report Volume II);

Appendix 9.B: Underwater Noise Assessment (PEI Report Volume II); and

Appendix 9.C: Habitats Regulations Assessment Stage 1 Screening (PEI Report Volume II).

9 Nature Conservation (Marine Ecology)

9.1 Introduction

9.1.1 This chapter presents the preliminary findings of the assessment of the likely effects of the Project on Marine Ecology. This chapter sets out the assessment methodology used, the datasets used to inform the assessment, an outline of baseline conditions, and sets out the likely significant effects the Project will have on marine ecology receptors.

9.1.2 There may be interrelationships related to the potential effects on Marine Ecology and other disciplines. Therefore, also refer to the following chapters:

a. **Chapter 6: Air Quality**;

b. **Chapter 10: Ornithology**;

c. **Chapter 16: Physical Processes**; and

d. **Chapter 17: Marine Water and Sediment Quality**.

9.1.3 Relevant aspects of the nature conservation and marine ecology assessment presented in this chapter will inform the Water Framework Directive (WFD) Assessment and also the Habitats Regulations Assessment (HRA) which will be prepared and included in the Environmental Statement (ES).

9.1.4 This chapter is also supported by the following figures and appendices:

a. **Figure 9.1:** Project specific subtidal benthic sampling stations (PEI Report, Volume III);

b. **Figure 9.2:** Internationally and nationally designated conservation sites (PEI Report, Volume III);

c. **Figure 9.3:** Spawning and nursery grounds of commercial fish species (PEI Report, Volume III);

d. **Figure 9.4:** TrAC fish monitoring stations in the vicinity of the Project (PEI Report, Volume III);

e. **Figure 9.5:** Annual grey seal pup counts at Donna Nook (Source: Ref 9-65) (PEI Report, Volume III);

f. **Figure 9.6:** Aerial counts of grey seals at Donna Nook (Source: Ref 9-65) (PEI Report, Volume III);

g. **Figure 9.7:** Harbour porpoise sightings in the Humber Estuary since 2000 (Source: Ref 9-30) (PEI Report, Volume III);

h. **Appendix 9.A:** Benthic Survey Report (PEI Report, Volume IV);

i. **Appendix 9.B:** Underwater Noise Assessment (PEI Report, Volume IV); and

j. **Appendix 9.C**: Habitats Regulations Assessment Stage 1 Screening (PEI Report, Volume IV).

9.2 Approach to Assessment

Scope and Methods

9.2.1 The following receptors have been considered as part of the assessment:

a. Nature conservation designations and protected species;

b. Benthic habitats and species;

c. Fish; and

d. Marine mammals.

9.2.2 There are no classified commercial shellfish (bivalve) beds in the Humber Estuary (Ref 9-1) and the areas around the Project and possible disposal sites do not support other commercial shellfisheries (such as crab/lobsters using creels or the collection of whelks). On this basis, commercial shellfisheries have, therefore, been scoped out of the assessment. Relevant fauna which are considered shellfish species (such as cockles or clams), however, are considered within the benthic habitats and species assessment.

9.2.3 Phytoplankton has also been scoped out of the assessment as while phytoplankton can be sensitive to changes in water quality, the predicted magnitude of potential changes in suspended sediments and contamination levels in the water column (as summarised in **Chapter 16 and 17** respectively) are not considered to be at a level which would cause lethal or sub-lethal effects in plankton. On this basis, phytoplankton has, been scoped out of the assessment.

9.2.4 A scoping exercise was undertaken in August 2022 to establish the form and nature of the Marine Ecology assessment, and the approach and methods to be followed.

9.2.5 The Scoping Report (**Appendix 1.A** of PEI Report Volume IV) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on Marine Ecology.

9.2.6 Following receipt of the Scoping Opinion (**Appendix 1.B** of the PEI Report Volume IV) as to the information to be provided in the ES, the requirements set out in **Table 9.1** have been identified by the Planning Inspectorate as those to be taken account of as part of the ongoing Marine Ecology assessment.

Table 9.1: Scoping opinion responses on Nature Conservation (Marine Ecology)

Consultee	Summary of Response	How comments have been addressed in this chapter
Environment Agency	Paragraph 8.2 makes no mention of pelagic ecology, in particular phytoplankton communities – these should be considered (even if they are scoped out) as there is a pathway for impact on this ecological element for example, as a result of sediment resuspension, contaminant release, changes to hydromorphology (these are highlighted in the physical processes and water quality sections). Neither is there any explicit mention of saltmarsh baseline data (although saltmarshes are discussed in the 'current baseline' sections). The Environment Agency holds saltmarsh data for the Humber Transitional waterbodies. We recommend the Applicant search on the Environment Agency's Ecology and Fish data explorer to see if additional data are available at https://environment.data.gov.uk/ecology/explorer/ We are satisfied with the survey rationale outlined in section 8.3.	Scoping opinion noted. Phytoplankton has also been scoped out of the assessment as while phytoplankton can be sensitive to changes in water quality, the predicted magnitude of potential changes in suspended sediments and contamination levels in the water column (as summarised in **Chapter 16**: **Physical Processes** and **Chapter 17: Marine Water and Sediment Quality** respectively) are not considered to be at a level which would cause lethal or sub-lethal effects in plankton. On this basis, phytoplankton has, been scoped out of the assessment. Further baseline saltmarsh data has been provided in the PEI Report.
Planning Inspectorate	The Scoping Report states that there are no classified commercial shellfish (bivalve) beds in the Humber Estuary and the areas around the Proposed Development and dredged sediment disposal sites do not support other commercial shellfisheries (such as crab/ lobsters using creels or the collection of whelks) and therefore seeks to scope out impacts on commercial shellfisheries. The Inspectorate agrees	Scoping opinion noted.

Consultee	Summary of Response	How comments have been addressed in this chapter
	that this matter can be scoped out of the assessment on this basis.	
	The Scoping Report states that the amount of 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. The Inspectorate agrees that this impact pathway is not likely to have a significant effect and can be scoped out.	Scoping opinion noted.
	The Scoping Report states that the pile structures have the potential to result in changes to hydrodynamic and sedimentary processes but such effects are anticipated to be negligible and highly localised (which would be confirmed by the physical processes assessment) and marine habitats and species are not expected to be sensitive to this level of change. The Inspectorate does not agree that this matter should be scoped out of the assessment as there is insufficient evidence that changes to hydrodynamic and sedimentary processes would not have any adverse significant effects	Scoping opinion noted. The preliminary assessment has confirmed that the effects of changes to hydrodynamic and sedimentary processes are highly localised (see **Chapter 16**: Physical Processes) This pathway is considered in **Section 9.5**.
	The Scoping Report states that the expected 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 marine species. The Inspectorate	Scoping opinion noted.

Consultee	Summary of Response	How comments have been addressed in this chapter
	agrees that this impact pathway is not likely to have significant adverse effects on marine species.	
	The Scoping Report proposes to scope impacts on fish from the capital dredge and disposal on the basis that the scale of the predicted changes are unlikely to cause anything more than negligible changes to fish habitats (feeding, spawning and nursery areas). The Inspectorate does not agree that this matter should be scoped out as changes in water and sediment quality during capital dredging and dredge disposal have been scoped into the assessment and there is insufficient evidence in the Scoping Report to demonstrate that changes to hydrodynamic and sedimentary processes would not have any adverse significant effects on fish habitats.	Scoping opinion noted. This pathway is considered in **Section 9.5**.
	The Scoping Report proposes to scope out an assessment of impacts on marine mammals as a result of changes to marine mammal foraging habitat and prey resources on the basis that the footprint of the Project only covers a highly localised area that constitutes a negligible fraction of the known ranges of local marine mammal populations. Given the limited scale of the area affected, the Inspectorate agrees that this matter can be scoped out of the assessment.	Scoping opinion noted.
	The Scoping Report proposes to scope out the potential for disturbance to hauled out seals on the basis of the distance between breeding populations and haul out sites to the proposed works (i.e. the	Scoping opinion noted.

Consultee	Summary of Response	How comments have been addressed in this chapter
	closest haul out site is observed to be on the north bank of the Humber Estuary, 3-4km from the dredge disposal sites and 4km from the DCO boundary). Given the large distances involved, the Inspectorate agrees that this matter should be scoped out of the assessment.	
	Impacts from vessels involved in construction and dredging activity are proposed to be scoped out on the basis that they would mainly be stationary or travelling at low speeds, making the risk of collision low. The Inspectorate agrees that this matter can be scoped out of the assessment on the basis that the collision risk is low and is not likely to have any adverse significant effects on marine mammals.	Scoping opinion noted.
	The Scoping Report proposes to scope out water quality impacts arguing that (1) the changes in suspended sediment levels would be localised, temporary and unlikely to result in adverse effects on marine mammals; (2) they are adapted to highly turbid conditions, and (3) contamination levels would be unlikely to produce lethal effects in these highly mobile species. In the absence of further data regarding sediment contamination levels and the potential water quality effect of the capital dredge, the Inspectorate is unable to scope this matter out of the assessment.	Scoping opinion noted. A more detailed rationale for scoping out water quality effects on marine mammals has been provided in **Table 9.11**.
	The Scoping Report proposes to scope out the potential for visual disturbance to hauled out seals because of the distance between breeding	Scoping opinion noted.

Consultee	Summary of Response	How comments have been addressed in this chapter
	populations and haul out sites to the proposed works. The Inspectorate agrees that this matter can be scoped out of the assessment on this basis.	
	The Scoping Report proposes to scope out this matter owing to the existing heavy shipping traffic and anticipated slow speeds of operational vessels (including maintenance dredging/ dredge disposal). The Inspectorate agrees that this matter can be scoped out of the assessment on the basis that the collision risk is low and is not likely to have any adverse significant effects on marine mammals.	Scoping opinion noted.
	In addition to the Humber Estuary European sites, the Proposed Development may also impact on the Greater Wash SPA and this should be considered within the ES.	Noted. The SPA is included in **Chapter 9: Terrestrial Ecology** and **Chapter 10: Ornithology** of the PEI Report.
	In addition to the assessment of the direct loss of intertidal and subtidal habitats and species as a result of the piles, the ES should also assess the potential for direct changes to benthic habitats and species underneath the raised pier structures, to determine their effect on the ecological function of the mudflats beneath.	Scoping opinion noted. Direct changes to benthic habitats and species underneath the raised pier structures has been scoped in and assessed in the operational phase (as the built infrastructure has the potential to result in this pathway).
	The impact of sediment resuspension and hydro-morphological changes on pelagic ecology receptors such as phytoplankton should be considered in the assessment of effects, unless otherwise robustly justified and agreed with relevant consultation bodies.	Phytoplankton has also been scoped out of the assessment as while phytoplankton can be sensitive to changes in water quality, the predicted magnitude of potential changes in suspended sediments and contamination levels in the water column (as summarised in **Chapter 16: Physical Processes** and **Chapter 17: Marine Water and**

Consultee	Summary of Response	How comments have been addressed in this chapter
		Sediment Quality respectively) are not considered to be at a level which would cause lethal or sub-lethal effects in plankton.
Natural England	The development site is within or may impact on the following European/internationally designated nature conservation site(s): •Humber Estuary Special Area of Conservation (SAC); •Humber Estuary Special Protection Area (SPA); •Humber Estuary Ramsar site. •Greater Wash Special Protection Area (SPA) Natural England broadly agrees with this section of the Scoping Report which detail the potential impact pathways on the designated sites during both construction and operation phases of the proposed development.	Scoping opinion noted.
	In addition, in the benthic habitats and species sections [with reference to Paragraph 8.4.4 (a) of the Scoping Report], we advise that direct changes to benthic habitats and species underneath the raised pier structures should also be assessed, to determine if it could affect the ecological function of the mudflats beneath. Natural England do not concur with the conclusion [with reference to Paragraph 8.4.4 (b) of the Scoping Report that Indirect changes to seabed habitats and species as a result of changes to hydrodynamic and sedimentary processes due to the capital dredge and disposal should be scoped out for fish] when 'Changes in water and sediment quality during capital dredging and dredge disposal' have been	Direct changes to benthic habitats and species underneath the raised pier structures has been scoped in and assessed in the operational phase (as the built infrastructure has the potential to cause effects for this pathway). A preliminary assessment of effects for this pathway is provided in **Section 9.5**. The predicted changes in hydrodynamic and sedimentary processes are very small. Based on preliminary modelling results (see **Chapter 16**; **Physical Processes**) and an understanding of the baseline conditions for fish it is very unlikely there would be any potential for effects on fish habitats (feeding, spawning and nursery areas) (see **Table 9.11**).

Consultee	Summary of Response	How comments have been addressed in this chapter
	scoped in. We would seek further clarification on this.	
	Impacts that maintenance dredging will have refer to notified feature having no sensitivity due 'to the scale of changes in SSC anticipated during capital dredging' [with reference to Paragraph 8.4.6 (a) (iii)]. These are two very different impacts therefore Natural England advise further consideration is given to the impacts of maintenance dredging will have on water quality.	The potential for impacts on water quality to affect marine mammals during capital dredging and disposal have been considered (see **Table 9.11**). The predicted changes in water quality during the capital dredge and disposal are negligible. Given that the maintenance dredging will be on a much smaller scale than capital dredging there are no anticipated effects.
	Natural England welcome the commitment to determine mitigation measure through the statutory consultation process.	Noted.

9.2.7 Having regard to the information presented within the Scoping Report (**Appendix 1.A** of PEI Report, Volume IV), the Planning Inspectorate's Scoping Opinion (**Appendix 1.B** of PEI Report, Volume IV) has also confirmed the Applicant's view that significant effects on: commercial shellfisheries; sediment deposition impacts of piling to benthic habitats and species; water quality effects due to piling on marine species, impacts to marine mammals as a result of changes to foraging habitat and prey resource; disturbance to hauled out seals; collision risk to marine mammals from vessels involved in construction and dredging are unlikely. Accordingly, these matters will remain scoped out of consideration in the ES.

9.3 Assessment Method

9.3.1 To facilitate the impact assessment process and ensure consistency in the terminology of significance, a standard assessment methodology will be applied to determine the significance of effects within the ES (see **Chapter 5: EIA Approach**). This methodology has been developed from a range of sources, including relevant Environmental Impact Assessment (EIA) Regulations, the EIA Directive (2014/52/EU), statutory and non-statutory guidance, consultations and ABPmer's previous (extensive) EIA project experience. The assessment also follows the principles of relevant guidance, including Institute of Environmental Management and Assessment (IEMA) guidelines, and the latest Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines for ecological impact assessment in the UK and Ireland (which combine advice for terrestrial, freshwater and coastal environments) (Ref 9-2). The methodology adopted is considered to be 'best practice'.

9.4 Legislation, Policy and Guidance

9.4.1 **Table 9.2** presents the legislation, policy and guidance relevant to the Marine Ecology assessment and details how their requirements will be met.

Table 9.2: Relevant legislation, policy and guidance regarding Marine Ecology

Legislation / Policy / Guidance	Consideration within the PEI Report
Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora ('The Habitats Directive') (Ref 9-3)	
The Habitats Directive (92/43/EEC) is intended to help maintain biodiversity throughout the EU Member States by defining a common framework for the conservation of wild plants, animals and habitats of community interest. It established a network of Special Areas of Conservation (SAC) designated by Member States to conserve habitats and species (listed in Annexes I and II).	The Humber Estuary SAC and features are described in **Section 9.4**. A preliminary consideration of impacts on SAC habitats and species is provided in **Section 9.5.** A Habitats Regulations Screening report has been produced and is provided in **Appendix 9.C** (PEI Report, Volume IV).

Legislation / Policy / Guidance	Consideration within the PEI Report
Council Directive 2009/147/EC on the conservation of wild birds ('The Birds Directive') (Ref 9-4)	
Directive 2009/147/EC on the conservation of wild birds is known as the 'Birds Directive'. It creates a comprehensive scheme of protection for all wild bird species. The Directive recognises that habitat loss and degradation are the most serious threats to the conservation of wild birds. It, therefore, places great emphasis on the protection of habitats for endangered as well as migratory species (listed in Annex I), especially through the establishment of a coherent network of Special Protection Areas (SPAs) comprising all the most suitable territories for these species.	The Humber Estuary SPA and qualifying features are described in **Chapter 10: Ornithology**. A preliminary consideration of impacts on coastal waterbirds which are features of these sites are outlined in **Section 10.5**. A Habitats Regulations Screening report has been produced and is provided in **Appendix 9.C** (PEI Report Volume IV)**.**
The Water Framework Directive 2000/60/EEC (Ref 9-5)	
The Water Framework Directive (2000/60/EEC) (WFD) establishes a framework for the management and protection of Europe's water resources. The overall objectives of the WFD is to achieve "good ecological and good chemical status" in all inland and coastal waters by 2021 unless alternative objectives are set or there are grounds for time limited derogation. For example, where pressures preclude the achievement of good status (e.g. navigation, coastal defence) in heavily modified water bodies (HMWBs), the WFD provides that an alternative objective of "good ecological potential" is set.	The Project (and associated disposal sites) is located within the Humber Lower water body (ID: GB530402609201) (further described in **Chapter 17: Marine Water and Sediment Quality**. A WFD compliance assessment will be prepared to support the DCO application which includes consideration of several key biological receptors, specifically habitats, fish, protected areas and invasive non-native species (INNS). The WFD compliance assessment will draw on information provided both in this chapter and other chapters within the ES.
Conservation of Habitats and Species Regulations 2017 as amended ('The Habitats Regulations') (Ref 9-6)	
The Habitats Directive and Birds Directive are transposed into UK law through the Conservation of Habitats and Species Regulations 2017 as amended, known as the "Habitats Regulations"[1]. The Habitats Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species' and the adaptation of planning and other controls for the protection of European Sites. The Regulations also require the compilation and maintenance of a	**Section 9.4** identifies protected habitats and species. A preliminary consideration of impacts on these receptors is provided in **Section 9.5**. A Habitats Regulations Screening report has been produced and is provided in **Appendix 9.C** (PEI Report Volume III)**.** This report will inform the consultation process and will aid the Competent Authority[2] in determining whether the Project has the potential for a likely significant effect (LSE) on the interest features and/or

1 Following the UK leaving the EU, the Conservation of Habitats and Species Regulations 2017 have been modified by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. Available at: https://www.legislation.gov.uk/uksi/2019/579/contents/made (accessed October 2021).

2 The Secretary of State is the Competent Authority for the HRA under the UK Habitats Regulations.

Legislation / Policy / Guidance	Consideration within the PEI Report
register of European sites, to include SACs (classified under the Habitats Directive) and SPAs (classified under the Birds Directive). These sites form the Natura 2000 network. These regulations also apply to Ramsar sites (designated under the 1971 Ramsar Convention for their internationally important wetlands), candidate SACs (cSAC), potential Special Protection Areas (pSPA), and proposed and existing European offshore marine sites.	supporting habitat of a European/Ramsar site either alone or in-combination with other plans, projects and activities and, if so, will inform the requirement to undertake an Appropriate Assessment (AA) of the implications of the proposals in light of the site's conservation objectives.
The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref 9-7)	
The Water Framework Directive (2000/60/EEC) is transposed into UK law through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 as amended, known as the Water Framework Regulations[3].	The Project (and associated disposal sites) is located within the Humber Lower water body (ID: GB530402609201) (further described in **Chapter 17: Marine Water and Sediment Quality**. A WFD compliance assessment will be prepared to support the DCO application which includes consideration of several key biological receptors, specifically habitats, fish, protected areas and invasive non-native species (INNS). The WFD compliance assessment will draw on information provided both in this chapter and other chapters within the ES.
Marine and Coastal Access Act 2009 (MCAA) (Ref 9-8)	
The MCAA provides the legal mechanism to help ensure clean, healthy, safe, productive, and biologically diverse oceans and seas by putting in place a new system for improved management and protection of the marine and coastal environment. The MCAA established the Marine Management Organisation (MMO) as the organisation responsible for marine planning and licensing. The Project will require a Marine Licence for the elements of the works below Mean High Water Springs including dredging, disposal and placing or removing objects on or from the seabed. For NSIPs the Development Consent Order (DCO) where granted may include provision deeming a marine licence to have been issued under Part 4 of the Marine and Coastal Access Act 2009. The MMO is responsible for enforcing, post-consent monitoring, varying, suspending, and revoking any deemed marine licence(s) as part of the DCO.	Information relevant to the marine licensing process is provided in the PEI Report including characterisation of the baseline for key marine ecology receptors (nature conservation sites, protected habitats and species, fish and marine mammals) (**Section 9.3**) and a preliminary assessment of impacts (**Section 9.5**). With respect to Marine Conservation Zones (MCZ), the Holderness Inshore MCZ is the nearest MCZ to the Project (located approximately 20 km away). This is considered to be beyond the zone of potential effects of the Project and as a consequence, a MCZ Assessment is not considered to be required.

[3] Following the UK leaving the EU, the main provisions of the WFD have been retained in English law through The Floods and Water (Amendment etc.) (EU Exit) Regulations 2019.

Legislation / Policy / Guidance	Consideration within the PEI Report
The Planning Act 2008 (PA2008) (Ref 9-9)	
Whilst the MCAA regulates marine licensing for works at sea, section 149A of the Planning Act 2008 enables an applicant for a DCO to include within the Order a Marine Licence which is deemed to be granted under the provisions of the MCAA.	Information relevant to the marine licensing process is provided in the PEI Report including characterisation of the baseline for key marine ecology receptors (nature conservation sites, protected habitats and species, fish and marine mammals) (**Section 9.4**) and a preliminary assessment of impacts (**Section 9.5**).
The Wildlife and Countryside Act 1981 (WCA) (Ref 9-10)	
The WCA is the principal mechanism for the legislative protection of wildlife in Great Britain. The WCA is the means by which the Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention), the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), the Birds Directive (79/409/EEC) and the Natural Habitats and Wild Fauna and Flora Directive (92/43/FFC) are implemented in Great Britain. The WCA applies to the terrestrial environment and inshore waters (0 to 12 nautical miles) and concerns the protection of wild animals and the designation of protected areas, including SSSIs.	**Section 9.4** identifies habitats and species which are protected under the WCA. A preliminary consideration of impacts on these receptors is provided in **Section 9.5**.
The Countryside and Rights of Way Act 2000 (CroW Act) (Ref 9-11)	
The CroW applies to England and Wales only. Part III of the CroW Act deals specifically with wildlife protection and nature conservation. The CroW Act places a duty on the Government to have regard for the conservation of biodiversity and maintain lists of species and habitats for which conservation steps should be taken or promoted, in accordance with the Convention on Biological Diversity. Schedule 9 of the CroW Act amends the SSSI provisions of the WCA, including increased powers for the protection and management of SSSIs. The provisions extend powers for entering into management agreements; place a duty on public bodies to further the conservation and enhancement of SSSIs; increase penalties on conviction where the provisions are breached; and include an offence whereby third parties can be convicted for damaging SSSIs.	**Section 9.4** identifies habitats and species for which SSSIs have been designated. A preliminary consideration of impacts on these receptors is provided in **Section 9.5**.
Natural Environment and Rural Communities Act 2006 (NERC Act) (Ref 9-12)	

Legislation / Policy / Guidance	Consideration within the PEI Report
The NERC Act came into force in October 2006. In addition to establishing Natural England (NE) as the body responsible for conserving, enhancing, and managing England's natural environment, the Act also made amendments to both the Wildlife and Countryside Act 1981 and the CroW Act 2000. For example, it extended the CroW Act's biodiversity duty to public bodies and statutory undertakers, and altered enforcement powers in connection with wildlife prosecution. In addition to this, the NERC Act contains a number of additional measures designed to help streamline delivery and simplify the legislative framework, such as changes to the remit and constitution of the Joint Nature Conservation Committee (JNCC), reconstitution of the Inland Waterways Amenity Advisory Council, and improving the governance arrangements for the National Parks. Section 41 of the NERC Act requires the SoS to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The list has been drawn up in consultation with NE, as required by the NERC Act.	**Section 9.4** identifies habitats and species for which are protected under the NERC Act (priority species and habitats of principal importance). A preliminary consideration of impacts on these receptors is provided in **Section 9.5**.
The Eels (England and Wales) Regulations (2009) (Ref 9-13)	
The Eels (England and Wales) Regulations 2009 implement Council Regulation (EC) No 1100/2007 of the Council of the European Union, establishing measures for the recovery of the stock of European eel. This includes the requirement to notify the Environment Agency of the construction, alteration or maintenance of any structure likely to affect the passage of eels and where any such structure exists, the requirement to construct and operate an eel pass to allow the free passage of eels.	**Section 9.4** provides background information on European eel in the vicinity of the Project and outlines their ecology and distribution. A preliminary consideration of impacts on European eel is provided in **Section 9.5.**
National Policy Statement for Ports (Ref 9-14)	
The National Policy Statement for Ports (NPSfP) provides the framework for decisions on proposals for new harbour facility developments that constitute an NSIP. This policy requires that in order to meet the requirements of the Government's policies on sustainable development, new port infrastructure should also, amongst other things, preserve, protect and where possible improve marine and terrestrial biodiversity, be adapted to the impacts of climate change and	A preliminary consideration of impacts on species and habitats including those which are features of internationally, nationally and locally designated sites of ecological importance are presented in **Section 9.5.** Where appropriate, mitigation has been included and this is outlined in **Section 9.3**.

Legislation / Policy / Guidance	Consideration within the PEI Report
provide high standards of protection for the natural environment. As highlighted in paragraphs 5.1.4 and 5.1.5 of the NPSfP, where the development is subject to EIA, the applicant should ensure that the PEI Report clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity. As highlighted in paragraphs 5.1.8 and 5.1.9 of the NPSfP, developments should aim to avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives. They should also ensure that appropriate weight is attached to designated sites of international, national and local importance.	
UK Marine Policy Statement (Ref 9-15)	
The UK Marine Policy Statement (MPS) is the framework for preparing marine plans and taking decisions affecting the marine environment. The MPS also sets out the general environmental, social and economic considerations that need to be taken into account in marine planning and provides guidance on the pressures and impacts that decision makers need to consider when planning for and permitting development in the UK marine areas. Paragraphs 3.1.7 and 3.1.8 of the MPS are relevant to the ecology assessment of the Project which, amongst other things, state that: “Marine plan authorities and decision makers should take account of how developments will impact on the aim to halt biodiversity loss and the legal obligations relating to all MPAs, their conservation objectives, and their management arrangements…” Marine plan authorities and decision-makers should take account of the regime for MPAs and comply with obligations imposed in respect of them. This includes the obligation to ensure that the exercise of certain functions contribute to, or at least do not hinder, the achievement of the objectives of an MCZ. This would also include the obligations in relevant legislation relating to SSSIs and sites designated under the Birds and Habitats Directives.	A preliminary consideration of impacts on species and habitats including those which are features of MPAs are presented in **Section 9.5**.

Legislation / Policy / Guidance	Consideration within the PEI Report
East Inshore and East Offshore Marine Plans (Ref 9-16)	
The East Inshore and East Offshore Marine Plans, which are collectively referred to as 'the East Marine Plans', were formally adopted on 2 April 2014. There are five policies within the East Marine Plans specifically related to nature conservation and marine ecology.	Provides general guidance. See considerations of specific policies below.
Policy ECO1 - Cumulative impacts affecting the ecosystem of the East marine plans and adjacent areas (marine, terrestrial) should be addressed in decision-making and plan implementation:	Information on the cumulative and in-combination effects assessment for the Project are included in **Chapter 25: Cumulative and In-Combination Effects** of this PEI Report.
Policy BIO1 - Appropriate weight should be attached to biodiversity, reflecting the need to protect biodiversity as a whole, taking account of the best available evidence on those habitats and species that are protected or of conservation concern in the East Marine Plans and adjacent areas (marine, terrestrial).	A preliminary consideration of impacts to habitats and species that are protected or of conservation concern is presented in **Section 9.5**.
Policy BIO2 - Where appropriate, proposals for development should incorporate features that enhance biodiversity and geological interests.	A preliminary consideration of design, mitigation and enhancement measures is outlined in **Section 9.3**.
Policy MPA1 - Any impacts on the overall MPA network must be taken into account in strategic level measures and assessments, with due regard given to any current agreed advice on an ecologically coherent network:	A preliminary consideration of impacts habitats and species that are features of MPAs is presented in **Section 9.5**. A Habitats Regulations Screening report has been produced and is provided in **Appendix 9.C** (PEI Report, Volume IV). MCZs are considered in **Section 9.5**.
Policy FISH2 - Proposals should demonstrate, in order of preference: a) that they will not have an adverse impact upon spawning and nursery areas and any associated habitat, b) how, if there are adverse impacts upon the spawning and nursery areas and any associated habitat, they will minimise them, c) how, if the adverse impacts cannot be minimised they will be mitigated, and d) the case for proceeding with their proposals if it is not possible to minimise or mitigate the adverse impacts	**Section 9.4** provides background information on fish spawning and nursery areas in the vicinity of the Project. A preliminary consideration of impacts on fish is provided in **Section 9.5**.
North East Lincolnshire Local Plan 2013 to 2032 (Ref 9-17)	
The North East Lincolnshire Local Plan was adopted in 2018 and covers the period 2013 to 2032. Policy 7 of the plan highlights that for operational port areas "proposals for port related use will be supported and, where appropriate,	A preliminary consideration of impacts on species and habitats and designated sites are presented in **Section 9.5**. A Habitats Regulations Screening report has been produced and is provided in **Appendix 9.C** (PEI Report, Volume IV).

Legislation / Policy / Guidance	Consideration within the PEI Report
approved by the Council if the submitted scheme accords with the development plan as a whole and subject to the ability to satisfy the requirements of the Habitats Regulations." In addition, Policy 41 of the plan states that: "*The Council will have regard to biodiversity and geodiversity when considering development proposals, seeking specifically to:* *A. establish and secure appropriate management of long-term mitigation areas within the Estuary Employment Zone, managed specifically to protect the integrity of the internationally important biodiversity sites (see Policy 9 'Habitat Mitigation - South Humber Bank');* *B. designate Local Wildlife Sites (LWSs) and Local Geological Sites (LGSs) in recognition of particular wildlife and geological value;* *C. protect manage and enhance international, national and local sites of biological and geological conservation importance, having regard to the hierarchy of designated sites, and the need for appropriate buffer zones;* *D. localize the loss of biodiversity features, or where loss is unavoidable and justified ensure appropriate mitigation and compensation measures are provided;* *E. create opportunities to retain, protect, restore and enhance features of biodiversity value, including priority habitats and species; and,* *F. take opportunities to retain, protect and restore the connectivity between components of the Borough's ecological network.* Any development which would, either individually or cumulatively, result in significant harm to biodiversity which cannot be avoided, adequately mitigated or as a last resort compensated for, will be refused".	

Stakeholder Engagement

9.4.2 A range of stakeholders have been engaged as part of the scoping process to obtain their views on the Project and the scope of the Marine Ecology assessment, the results of which are presented within the Scoping Opinion (**Appendix 1.B** of the PEI Report, Volume IV). A meeting was held with Natural England on 23rd November 2022 to provide an overview of the Project and to discuss the impact pathways relevant to marine ecology receptors.

Limitations and Assumptions

9.4.3 The information presented in this preliminary assessment reflects that obtained and evaluated at the time of reporting and is based on an emerging design for the Project and the maximum likely extents of land required for its construction and operation.

9.4.4 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further through the assessment and consultation processes, and as further research and investigative surveys are completed to fully understand its potential effects. This assessment is informed by the assessment of changes to physical processes which is based on preliminary outputs from hydrodynamic modelling. Further model runs will be carried out and a calibration report produced to inform the ES.

9.4.5 This assessment has been undertaken based on the following assumptions:

a. The scheme design and project methodology, as detailed in **Chapter 2: The Project** and **Chapter 3: Need and Alternatives**;

b. The underwater noise assessment assumes that more than one piling rig with impact hammers will be used concurrently with up to four tubular piles to be installed each day using up to four piling rigs as a worst case;

c. The underwater noise assessment assumes that the dredging and vessel activity will take place continuously (24/7) during construction and as such, provides a precautionary assessment;

d. During operation, periodic maintenance dredging will be required; and

e. The underwater noise assessment assumes that marine mammals will evade the noise source.

9.4.6 Whilst these are assumptions, the assessment within this PEI Report has been undertaken considering the anticipated worst-case scenario in respect of marine ecology receptors at the dredge, piling and disposal locations.

Study Area

9.4.7 The study area for this assessment is the area over which potential direct and indirect effects of the Project are predicted to occur during the construction and operational periods. The direct effects on nature conservation and marine ecology receptors are those that occur within the footprint of the Project, such as the direct disturbance to benthic habitats and associated species as a result of construction. Indirect effects are those that may arise outside this footprint, such as the potential noise and visual disturbance effects on waterbirds during construction.

9.4.8 The study area for the nature conservation and marine ecology topic is focused on the Port of Immingham and proposed disposal sites with data for the wider Humber Estuary region presented where relevant to provide contextual information and to ensure the area of potential effects (e.g., noise disturbance) are fully considered.

9.5 Baseline Conditions

Current Baseline

Data and information sources

9.5.1 Current baseline conditions have been determined by a desk-based review of available information. A project-specific subtidal benthic survey has also been undertaken to characterise seabed habitats and species within and near to the proposed dredge footprint.

9.5.2 The main desk-based sources of information that have been reviewed to inform the current baseline description within the vicinity of the Project include:

Nature conservation sites

a. Natura 2000 standard data forms or information sheets for each designation: Information on the species and habitats listed in the original citations (Ref 9-39; Ref 9-40; Ref 9-41; Ref 9-42);

b. Multi-Agency Geographic Information for the Countryside (MAGIC) Interactive Map (Ref 9-19): Information on the boundaries of designated sites; and

c. Natural England Conservation Advice for Marine Protected Areas: Humber Estuary Special Area of Conservation (SAC) (Ref 9-20) and Humber Estuary Special Protection Area (SPA) (Ref 9-21).

Benthic habitats and species

a. Recent Port of Immingham Benthic Surveys between the Immingham Oil Terminal and Eastern Jetty. This included ten intertidal stations sampled in September 2021 using a 0.01 m² hand-held core and ten subtidal stations that were sampled in September 2021 using a 0.1 m² Day Grab. In addition, six stations were sampled at dredge disposal sites HU060 and HU056 in September 2021 using a 0.1 m² Day Grab (four within each of the disposal sites and two nearby to each of the disposal sites);

b. Able Marine Energy Park Benthic Surveys: The results of intertidal benthic surveys (undertaken in 2015 and 2016) using a 0.01 m² core sample and a subtidal survey in 2016 using a 0.1 m² Day Grab in the North Killingholme area (Ref 9-22);

c. Humber Estuary SAC Intertidal Sediment Survey: Ecological survey work undertaken in 2014 to monitor and assess the intertidal mudflat and sandflat communities of the Humber Estuary (Ref 9-45);

d. Immingham Outer Harbour (IOH) Benthic Surveys: Intertidal sampling at 14 stations (using a Day Grab (0.06 m²) or Van Veen Grab (0.03 m²) and subtidal sampling at 17 stations in the Port of Immingham area in 2009 (Ref 9-23);

e. South Humber Channel Marine Studies: Benthic sampling in the intertidal (using a 0.01 m² core from 36 stations) and subtidal (0.1 m² Hamon grab

from 30 stations) between the Humber Sea Terminal and Immingham Port undertaken in 2010 (Ref 9-24);

f. HU056 Disposal Site Monitoring: Benthic invertebrate samples collected at five sites within the disposal sites and at six locations nearby (triplicate samples at all locations) in 2017 (Ref 9-25); and

g. Clay Huts Disposal Site Benthic Monitoring: Benthic invertebrate samples collected from four stations in 2008 from within and near to the Clay Huts disposal sites (Ref 9-23).

Fish

a. South Humber Channel Marine Studies: Fish surveys in the intertidal (four double-ended fyke nets) and subtidal (eight beam trawls) between the Humber Sea Terminal and Port of Immingham undertaken in 2010 (Ref 9-24). These sites are located approximately 3 to 4km from the Project;

b. Review of fish population data in the Humber Estuary: A review of available data to describe the fish populations in the Humber Estuary (Ref 9-58);

c. The Humber Regional Environmental Characterisation (REC): Fish ecology information provided in the Marine Aggregate Levy Sustainability Fund (Ref 9-26);

d. Environment Agency TraC Fish Monitoring: The results of the most recently available WFD fish monitoring for the nearest sites to the Project (seine netting/bream trawls at Foulholme Sands and otter trawls at Burcom). The Foulholme Sands surveys were undertaken twice a year in the spring and autumn with the Burcom surveys annually in the early winter. These sites are located approximately 3-5 km from the Project with data available up to 2017 for Foulholme Sands and 2019 for Burcom (Ref 9-27);

e. Cefas Spawning and Nursery Grounds of Selected Fish Species in UK waters: Distribution maps of the main spawning and nursery grounds for 14 commercially important species (cod, haddock, whiting, saithe, Norway pout, blue whiting, mackerel, herring, sprat, sandeels, plaice, lemon sole, sole and Norway lobster) (Ref 9-28); and

f. Fish Atlas of the Celtic Sea, North Sea, and Baltic Sea: The study provides an overview of information collected from internationally coordinated and national surveys and presents data and information on the recent distribution and biology of demersal and small pelagic fish in these ecoregions (Ref 9-29).

Marine mammals

a. Donna Nook Seal Counts: The latest pup counts available from the Lincolnshire Wildlife Trust for winter 2021/22 and 2020/21;

b. Sea Watch Foundation Review of Marine Mammals in the Humber Estuary Region: Information on cetacean status and distribution in the area derived from survey data and the national sightings database maintained by the Sea

Watch Foundation with sightings data from 2000 onwards analysed (Ref 9-30);

c. Records of marine mammal sightings from the Lincolnshire Environmental Records Centre (Ref 9-31) and National Biodiversity Network (Ref 9-32);

d. Distribution maps of cetacean and seabird populations in the North-East Atlantic: Distribution maps of cetaceans and seabirds based on survey data in the North-East Atlantic between 1980 and 2018 collated and standardised (Ref 9-33);

e. At-sea Distribution Data for Grey and Harbour Seals: The latest habitat-based predictions of at-sea distribution for grey and harbour seals in the British Isles (including the Humber Estuary region) estimated using data from animal-borne telemetry tags by the Sea Mammal Research Unit (SMRU) (Ref 9-34);

f. Donna Nook Telemetry Data; The results of the tagging of 11 grey seals from the Donna Nook colony to understand the movements of grey seals in the region (Ref 9-35);

g. Special Committee on Seals (SCOS) Annual Report: Information on the status of seals around the UK coast is reported annually by the SMRU advised SCOS (Ref 9-36);

h. The Identification of Discrete and Persistent Areas of Relatively High Harbour Porpoise Density in the Wider UK Marine Area: The report presents the results of 18 years of survey data in the Joint Cetacean Protocol (JCP), undertaken to inform the identification of discrete and persistent areas of relatively high harbour porpoise density in the UK marine area (Ref 9-37); and

i. Small Cetaceans in European Atlantic Waters and the North Sea (SCANS) III Data: Cetacean surveys to estimate the abundance of cetacean species in shelf and oceanic waters of the European Atlantic undertaken in 2016. Teams of observers searched along 60,000 km of transect line, recording thousands of groups of cetaceans from 19 different species. The survey (SCANS-III) is the third in a series that began in 1994 (SCANS) and continued in 2005 (SCANS-II) (Ref 9-38).

9.5.3 Site specific surveys -that have been undertaken to underpin the assessments include:

a. **Subtidal benthic sampling:** Eight subtidal stations were sampled in July 2022 (using a 0.1 m² Day Grab) within and near to the Project footprint. The location of the survey stations is shown in **Figure 9.1** (PEI Report, Volume III). All the samples collected were analysed for macrofaunal analysis (faunal composition, abundance and biomass), Particle Size Analysis (PSA) and Total Organic Carbon (TOC). The methods and results of these surveys are included in **Appendix 9.A** (PEI Report, Volume IV) and summarised in **Section 9.6** of this chapter.

Nature conservation sites and protected species

Designated sites

9.5.4 The Project falls within the boundaries of the Humber Estuary SAC, SPA and Ramsar site (collectively forming the Humber EMS; **Figure 9.1** (PEI Report, Volume III)). For the Humber Estuary SAC, the primary reason for designation is the presence of two broad scale habitats, 1130 Estuaries and 1140 Mudflats and sandflats not covered by seawater at low tide (Ref 9-39). These broad scale habitats support other more specific habitats which are qualifying features but not a primary reason for designation. These are:

a. 1110 Sandbanks which are slightly covered by sea water all the time;

b. 1150 Coastal lagoons (identified as a priority feature);

c. 1310 *Salicornia* and other annuals colonizing mud and sand;

d. 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae);

e. 2110 Embryonic shifting dunes;

f. 2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes');

g. 2130 Fixed coastal dunes with herbaceous vegetation ('grey dunes') (identified as a priority feature); and

h. 2160 Dunes with *Hippopha rhamnoides*.

9.5.5 Alongside the habitats for which the SAC is designated, there are also three mobile species listed on Annex II of the EU Habitats Directive (92/43/EEC) (the Natural Habitats and Wild Fauna and Flora Directive) included in the designation (Ref 9-39), namely:

a. 1095 Sea lamprey (*Petromyzon marinus)*;

b. 1099 River lamprey (*Lampetra fluviatilis)*; and

c. 1364 Grey seal (*Halichoerus grypus*).

9.5.6 Qualifying features of the Humber Estuary SPA and Humber Estuary Ramsar site are shown in **Table 9.3** and **Table 9.4** respectively.

Table 9.3: Qualifying features of the Humber Estuary SPA (Ref 9-40)

Internationally Important Populations	
Internationally Important Populations of Regularly Occurring Annex 1 Species	
Breeding Species Population	
Bittern *Botaurus stellaris*	2 calling males (10.5 % of the GB population)
Marsh Harrier *Circus aeruginosus*	10 breeding females (6.3 % of the GB population)
Avocet *Recurvirostra avosetta*	64 pairs (8.6 % of the GB population)

Internationally Important Populations	
Little Tern *Sternula albifrons*	51 pairs (2.1 % of the GB population)
Wintering Species Population	
Bittern	4 (4.0 % of the GB population)
Hen harrier *Circus cyaneus*	8 (1.1 % of the GB population)
Bar-tailed Godwit *Limosa lapponica*	2,752 (4.4 % of the GB population)
Golden Plover *Pluvialis apricaria*	30,709 (12.3 % of the GB population)
Avocet *Recurvirostra avosetta*	54 (1.7 % of the GB population)
On passage Species population	
Ruff *Calidris pugnax*	128 (1.4 % of the GB population)
Internationally Important Populations of Regularly Occurring Migratory Species	
Wintering Species Population	
Teal† *Anas crecca*	2,322 (<1 % of the population)
Wigeon† *Mareca penelope*	5,044 (<1 % of the population)
Mallard† *Anas platyrhynchos*	2,456 (<1 % of the population)
Turnstone† *Arenaria interpres*	629 (<1 % of the population)
Common Pochard† *Aythya ferina*	719 (<1 % of the population)
Greater Scaup† *Aythya marila*	127 (<1 % of the population)
Brent Goose† *Branta bernicla*	2,098 (<1 % of the population)
Goldeneye† *Bucephala clangula*	467 (<1 % of the population)
Sanderling† *Calidris alba*	486 (<1 % of the population)
Dunlin *Calidris alpina*	22,222 (1.7 % of the Northern Siberia/Europe/Western Africa population)
Red Knot *Calidris canutus*	28,165 (6.3 % of the North-eastern Canada/Greenland/Iceland/North-western Europe population)
Ringed Plover† *Charadrius hiaticula*	403 (<1 % of the population)
Oystercatcher† *Haematopus ostralegus*	3503 (<1 % of the population)

Internationally Important Populations	
Black-tailed Godwit *Limosa*	1,113 (3.2 % of the Icelandic Breeding population)
Curlew† *Numenius arquata*	3,253 (<1 % of the population)
Grey Plover† *Pluvialis squatarola*	1,704 (<1 % of the population)
Shelduck *Tadorna tadorna*	4,464 (1.5 % of the North-western Europe population)
Redshank *Tringa totanus*	4,632 (3.6 % of the Eastern Atlantic Wintering population)
Northern Lapwing† *Vanellus vanellus*	22,765 (<1 % of population)
On passage Species Population	
Sanderling†	818 (<1 % of the population)
Dunlin	20,269 (1.5 % of the Northern Siberia/Europe/Western Africa population)
Red Knot	18,500 (4.1 % of the North-eastern Canada/Greenland/Iceland/North-western Europe population)
Ringed Plover†	1,766 (<1 % of the population)
Black-tailed Godwit	915 (2.6 % of the Icelandic Breeding population)
Whimbrel† *Numenius phaeopus*	113 (<1 % of the population
Grey Plover†	1,590 (<1 % of the population)
Greenshank† *Tringa nebularia*	77 (<1 % of the population)
Redshank	7,462 (5.7 % of the Eastern Atlantic Wintering population)
Internationally Important Assemblage of Waterfowl	
Waterfowl assemblage	153,934 waterfowl
†Species with this symbol do not represent a population that is > 1 % of the international threshold but are included in the waterfowl assemblage.	

Table 9.4: Qualifying marine features of the Humber Estuary Ramsar Site (Ref 9-41)

Ramsar Criterion
Criterion 1 – natural wetland habitats that are of international importance

Ramsar Criterion	
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.	
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 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	
Species	Spring/Autumn Population (5-year peak mean 1996-2000)
Golden Plover	17,996 (2.2 % of the Iceland & Faroes/East Atlantic population)
Red Knot	18,500 (4.1 % of the West & Southern African wintering population)
Dunlin	20,269 (1.5 % of the West Siberia/West Europe population)
Black-tailed Godwit	915 (2.6 % of the Iceland/West Europe population)
Redshank	7,462 (5.7 % of the population)
Species	Wintering Population (5-year peak mean 1996/7-2000/1)
Shelduck	4,464 (1.5 % of the North-western Europe Population)
Golden Plover	30,709 (3.8 % of the Iceland & Faroes/East Atlantic population)
Red Knot	28,165 (4.1 % of the West & Southern African wintering population)
Dunlin	22,222 (1.7 % of the West Siberia/West Europe population)
Black-tailed Godwit	1,113 (3.2 % of the Iceland/West Europe population)

Ramsar Criterion	
Bar-tailed Godwit	2,752 (2.3 % of the West Paleartic population)
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.	

9.5.7 The Greater Wash SPA is designated for a range of seabird and diving bird species and is located approximately 20 km from the Project. Qualifying features of this site is shown in **Table 9.5**.

Table 9.5: Qualifying marine features of the Greater Wash SPA (Ref 9-42)

Internationally Important Populations	
Internationally Important Populations of Regularly Occurring Annex 1 Species	
Breeding Species Population	
Little Tern *Sternula albifrons*	798 pairs (42% of GB breeding population)
Common Tern *Sterna hirundo*	510 pairs (5.1% of GB breeding population)
Sandwich Tern *Sterna sandvicensis*	852 pairs (35% of GB breeding population)
Wintering Species Population	
Little Gull *Hydrocoloeus minutus*	1,255 (no current GB population estimate)
Red-throated Diver *Gavia stellata*	1,407 (8.3% of GB non-breeding population)
Internationally Important Populations of Regularly Occurring Migratory Species	
Common Scoter *Melanitta nigra*	3,449 (0.6% of biogeographic population)

9.5.8 The Humber Estuary Site of Special Scientific Interest (SSSI) overlaps part of the Project site. This is designated for its nationally important habitat assemblage (intertidal mudflats and sandflats, and coastal saltmarsh) geological interest, importance to breeding, wintering and passage birds, breeding grey seal and the presence of river and sea lamprey.

9.5.9 North Killingholme Haven Pits SSSI is located approximately 5 km away from the Project. This site comprises saline lagoon habitats and supports important populations of waders including Black-tailed Godwits and Redshank. The Lagoons SSSI is located approximately 20 km from the Project and supports a variety of coastal habitats (such as saline lagoons and sand dunes) as well as a

population of breeding Little Terns. The impacts on species and habitats which are features for which SSSIs have been designated are assessed in **Section 9.5**.

9.5.10 The Holderness Inshore MCZ is the nearest MCZ to the Project (located approximately 20 km away). The site is designated for intertidal sand and muddy sand as well as a variety of subtidal rock and sedimentary habitats.

9.5.11 The nearest Local Nature Reserve (LNR) is Cleethorpes Sands LNR (located approximately 13 km south east of the Project) which supports a variety of intertidal and coastal habitats.

Protected species

9.5.12 The Wildlife and Countryside Act 1981 (as amended) (WCA) protects various animals, plants, habitats in the UK. Relevant protected WCA species recorded in the Humber Estuary region include:

a. The tentacled lagoon worm *Alkmaria romijni*;

b. The lagoon sand shrimp *Gammarus insensibilis*;

c. Twaite shad *Alosa fallax* and allis shad *Alosa alosa*;

d. Cetacean (whale and dolphin) species; and

e. All bird species.

9.5.13 Marine species are also protected from being killed, injured or disturbed both inside and outside designated sites under the provisions of the Habitats Directive. Of relevance to the Humber Estuary are:

a. Common seal *Phoca vitulina* and grey seal *Halichoerus grypus* (listed in Annex II and V);

b. Bottlenose dolphin *Tursiops truncatus* and harbour porpoise *Phocoena phocoena* (listed in Annex II and IV);

c. Sea lamprey Petromyzon marinus (listed in Annex II) and river lamprey (listed in Annex II and V);

d. Twaite shad *A. fallax* and allis shad *A. alosa* (listed in Annex II and V); and

e. Atlantic salmon *Salmo salar* (listed in Annex II and V).

9.5.14 Seals are also protected under the Conservation of Seals Act 1970.

9.5.15 In addition, some marine fauna and habitats are listed as priority species and habitats of principle importance in England, as required under Section 41 of the NERC Act. Species of principal importance which are of relevance to the Humber Estuary include various species of waterbird, commercial fish (such as cod *Gadus morhua* and herring *Clupea harengus*), migratory fish (such as lampreys, European smelt *Osmerus eperlanus*, Atlantic salmon *Salmo salar* and European eel *Anguilla anguilla*).

9.5.16 Habitats of principle importance which are of relevance to the Humber Estuary include intertidal mudflats, coastal saltmarsh, saline lagoons and sand dunes. Based on the current geographic extent and location of habitats of principal importance under Section 41 of the Natural Environment and Rural Communities

Act 2006 that are publicly available on the MAGIC website (Ref 9-19), the proximity of these coastal and intertidal habitats to the Project are described below:

a. Mudflats: The intertidal habitat directly overlaps the footprint of the Project;

b. Coastal saltmarsh: The nearest saltmarsh habitat is located approximately 3 km to the northwest of the Project;

c. Coastal sand dunes: The nearest coastal sand dunes within the Humber SAC are located more than 12 km southwest of the Project at Cleethorpes; and

d. Saline lagoons: The nearest coastal lagoon habitat within the Humber Estuary is located approximately 5 km from the Project at Killingholme.

9.5.17 European eels are also afforded protection as part of the Eels (England and Wales) Regulations 2009 (Ref 9-13). The regulations which apply to all freshwater and estuarine waters of England and Wales give powers to statutory bodies to implement measures for the recovery of European eel stocks including improving access, habitat quality and easing fishing pressure.

Benthic habitats and species

Humber Estuary overview

9.5.18 The Humber Estuary supports a wide variety of marine habitats including intertidal mudflats and sandflats, intertidal seagrass beds, coastal lagoons, saltmarsh, reedbeds, subtidal sandbanks and mixed sediment habitats (Ref 9-43; Ref 9-44; Ref 9-45).

9.5.19 The intertidal area of the Humber Estuary is extensive, covering approximately 10,000 ha, of which more than 90 % is mudflat and sandflat (Ref 9-46). The largest areas of mudflat occur in the outer Humber Estuary at Spurn Bight and Pyewipe, at Foul Holme and Skitter Sand in the mid Humber Estuary and across most of the Estuary width in the inner estuary above the Humber Bridge. This habitat changes from moderately exposed sandy shores at the mouth of the Humber Estuary to sheltered muddy shores within the main body of the Estuary and up into the tidal rivers. The mid and upper Humber Estuary is characterised by fringing reedbeds *Phragmites australis* on the upper shore while saltmarshes are present along the north bank and on the Lincolnshire coast east of Cleethorpes (Ref 9-46; Ref 9-20; Ref 9-21; Ref 9-45).

9.5.20 The subtidal area of the Humber Estuary is approximately 16,800 ha in extent (Ref 9-46). The subtidal environment of the Humber Estuary is highly dynamic and varies according to the composition of the bottom sediments, salinity, sediment load and turbidity and dissolved oxygen. Many of these factors vary with the season or state of the tide. Subtidal sand (including muddy sand) is the predominant subtidal sediment type in the Humber Estuary. The high mobility of sediments and high turbidity means that this habitat is typically relatively impoverished with a limited fauna characterised by very low densities of opportunistic species and species adapted to these conditions (Ref 9-20; Ref 9-21; Ref 9-46).

9.5.21 Invasive marine species known to occur in the Humber Estuary region include slipper limpet *Crepidula fornicata*, Chinese mitten crab *Eriocheir sinensis*, Pacific oyster *Magallana gigas* and acorn barnacle *Austrominius modestus* (Ref 9-44; Ref 9-24; **Appendix 9.A** (PEI Report, Volume IV)).

Intertidal habitats and species in the Port of Immingham area

9.5.22 Intertidal benthic surveys undertaken in the Port of Immingham area in 2021 recorded sandy mud habitat with the number of taxa found in the samples ranging from four to 15. The number of individuals was also highly variable and ranged from 1,100 organisms per m² to 40,600 organisms per m². The samples were predominantly characterised by nematodes, the oligochaetes *Tubificoides benedii* and *Enchytraeidae* spp., the mud shrimp *Corophium volutator*, the mudsnail *Peringia ulvae*, Baltic tellin *Limecola balthica* as well as the polychaetes *Hediste diversicolor* and *Pygospio elegans* recorded in the samples. These species dominated the assemblage and contributed almost entirely to the total abundances of organisms recorded at most of the sites surveyed.

9.5.23 The assemblage recorded was considered typical of the community recorded on mudflats in the nearby area (Ref 9-23; Ref 9-24; Ref 9-22). For example, intertidal surveys at North Killingholme (located approximately 3 km from the Project) in 2015 and 2016 also recorded a benthic assemblage characterised by species such as *Corophium volutator, Tubificoides benedii, Pygospio elegans, Hediste diversicolor, Limicola balthica* and nematodes with a broadly similar total number of individuals in the samples (up to around 50,000 organisms per m²) (Ref 9-22).

9.5.24 Many of the species recorded in the samples are considered prey species for coastal waterbirds such as polychaetes, Baltic tellin *Limecola balthica*, mudsnail *Peringia* spp. and mudshrimp *Corophium* spp. (Ref 9-56; Ref 9-57).

Project specific subtidal benthic surveys

9.5.25 In order to characterise the subtidal benthic communities present in the vicinity of the Project, subtidal sampling was undertaken in July 2022.

9.5.26 At each station, a sample was analysed for macrofaunal analysis (faunal composition, abundance and biomass), Particle Size Analysis (PSA) and Total Organic Carbon (TOC).

9.5.27 The results of these project specific benthic surveys are summarised below in **Table 9.6** with the methods and results described in more detail in **Appendix 9.A** (PEI Report, Volume IV).

9.5.28 The sediment from samples collected from the area consisted of mud and sandy mud. The TOC in the samples ranged between approximately 3 % and 6 % (**Table 9.5**).

9.5.29 The samples collected were highly impoverished with the number of taxa found in the samples ranging from one (Station 3) to 8 (Station 1), and the number of individuals from 10 organisms per m² (Station 3) to 190 organisms per m² (Station 1). The range in total species biomass in the samples was between <1 and 1.8 grams per m².

9.5.30 The faunal samples were characterised by low numbers of species (occurring in low abundances) including polychaetes (such *Nephtys* spp, *Streblospio shrubsolii* and *Scoloplos armiger*), nematodes, oligochaetes *Tubificoides* spp and crustacean *Diastylis rathkei*. All the species recorded from the samples in this area were considered commonly occurring in the region and not protected.

9.5.31 The faunal assemblage recorded is considered characteristic of subtidal habitats in this section of the Humber Estuary. For example, subtidal benthic surveys undertaken in the Immingham area in 2009, 2010, 2016 and 2021 predominantly recorded mud or muddy sand habitat which was generally impoverished (with a low number of taxa occurring at the majority of sites). The most commonly recorded infaunal species (generally recorded in low abundances) were the polychaetes *Capitella capitata*, *Streblospio shrubsolii, ,Pygospio elegans, Polydora cornuta*, oligochaetes *Tubificoides* spp., mud shrimp *Corophium volutator*, and nematodes (Ref 9-23; Ref 9-24; Ref 9-22).

Subtidal habitats and species at the disposal site

9.5.32 At present, subject to confirming a requirement for the disposal of dredge arisings and identifying alternative beneficial disposal options, it is envisaged that the majority of material would be deposited at either the Clay Huts disposal site (HU060) or Holme Channel disposal site (HU056).

9.5.33 Benthic surveys undertaken in 2021 within and near to Clay Huts disposal site (HU060) recorded predominantly sand habitat with the samples characterised by a wide range of species but typically in low abundances including nematodes, barnacle *Amphibalanus improvises*, polychaetes (such as *Pygospio elegans* and *Arenicola* spp.) and the amphipod *Corophium volutator*. Benthic sampling at the Holme Channel disposal site (HU056) recorded sand, gravelly sand and sandy gravel habitat with a highly impoverished assemblage characterised by low abundances of a few species (the amphipod *Corophium volutator*, mysid shrimp *Gastrosaccus spinifer*, bryozoan *Electra monostachys* and springtails *Collembola* spp.) (Ref 9-23).

Table 9.6: Subtidal benthic survey results

Station	Sediment Type	TOC (%)	No. of Taxa (per m²)	No. of Individuals (per m²)	Total Biomass (g per m²)	Key Characterising Species (Number per m² Shown in Brackets)
1	Mud	6.45	8	190	0.02	*Tubificoides swirencoides* (60) *Nephtys spp* (40) *Diastylis rathkei* (20) *Nematoda* (20) *Streblospio shrubsolii* (20) *Corophium volutator* (10) *Macoma balthica* (10) *Nephtys hombergii* (10)
2	Mud	6.34	2	30	0.05	*Nematoda* (20) *Diastylis rathkei* (10)
3	Mud	5.37	1	10	<0.01	*Streblospio shrubsolii* (10)
4	Sandy Mud	4.38	2	120	0.06	*Nepthys spp* (110) *Diastylis rathkei* (10)
5	Sandy Mud	3.07	2	70	0.03	*Nepthys spp* (60) *Scoloplos armiger* (10)

Station	Sediment Type	TOC (%)	No. of Taxa (per m²)	No. of Individuals (per m²)	Total Biomass (g per m²)	Key Characterising Species (Number per m² Shown in Brackets)
6	Sandy Mud	3.77	5	100	1.79	*Nepthys spp* (60) *Arenicola marina* (10) *Austrominius modestus* (10) *Scoloplos armiger* (10)
7	Sandy Mud	4.50	3	80	0.11	*Nepthys spp* (40) *Diastylis rathkei* (20) *Nematoda* (20)
8	Sandy Mud	3.67	4	110	0.03	*Nepthys spp* (80) *Mytilus edulis* (10) *Nematoda* (10) *Tubificoides swirencoides* (10)

Fish

Humber Estuary overview

9.5.34 The Humber Estuary contains a varied fish fauna, totalling over 80 species with the majority common to most UK estuaries. The Humber Estuary fish assemblage comprises resident, nursery, seasonal and migratory species, typical of estuarine fish communities (Ref 9-58; Ref 9-59).

9.5.35 In general, the abundance and diversity of fish increases towards the mouth of the estuary. The outer reaches are characterised by a community dominated by inshore marine species such as whiting *Merlangius merlangus*, cod *Gadus morhua*, plaice *Pleuronectes platessa* and Dover sole *Solea solea*. The middle and upper reaches of the estuary support more euryhaline species including flounder *Platichthys flesus*, European eel *Anguilla anguilla*, gobies and sprat *Spratus spratus* (Ref 9-60; Ref 9-59).

9.5.36 The Humber Estuary supports a fish assemblage typical of other estuaries in North Western Europe. However, a higher fish diversity than recorded in other estuaries in the UK has been found which may be due to the large catchment area and high fluvial flow allowing freshwater taxa to actively or passively occur in greater numbers into this estuary (Ref 9-61).

9.5.37 The baseline review presented in this chapter has primarily focused on key species which are of either commercial and/ or conservation importance. The functional guilds for estuarine fish used in Ref 9-58 which were based on published guild definitions (Ref 9-62; Ref 9-63) have been used to help summarise the life history and ecology of fish species occurring in the Humber Estuary, as follows:

a. Diadromous species (D): Species using estuaries as pathways of migration (for reproduction) between fresh waters and the sea; migration from fresh water to sea water to breed (catadromous species, e.g. eel), and in the opposite direction (anadromous species, e.g., salmonids and lampreys);

b. Marine migrant species (MM): Marine species that spawn at sea and regularly enter estuaries in large numbers, thus having a temporary residence in the estuarine habitat; they usually are highly euryhaline species, able to move throughout the full length of the estuary, and spending much of their life within estuaries, using these habitats as nursery grounds or visiting them regularly at sub-adult and adult life stages;

c. Estuarine resident species (ES): Species that are able to reproduce and complete their life cycle in the estuary; as such they are highly euryhaline species, able to move throughout the full length of the estuary;

d. Marine straggler species (MS); Marine species usually associated with coastal marine waters but entering estuaries accidentally in low numbers. These are predominantly stenohaline species, occurring most frequently in the lower sections of the estuary; and

e. Freshwater species (F): Species of freshwater origin that regularly or accidentally enter estuaries, in moderate to low numbers, moving varying

distances down the estuary but often restricted to low-salinity, upper reaches of estuaries and to periods of freshwater flooding.

9.5.38 **Table 9.7** provides a summary of species that have been recorded in the Humber Estuary (based on Ref 9-58) with further information on key species within each ecological guild provided below.

Table 9.7: Fish recorded in the Humber Estuary, grouped by ecological guilds.

Ecological guild	Species name	Common name	Ecological guild	Species name	Common name
Diadromous (D)	*Alosa alosa*	Allis shad	Marine stragglers (MS)	*Hyperoplus immaculatus*	Greater sandeel
	Alosa fallax	Twaite shad		*Hyperoplus lanceolatus*	Great sandeel
	Osmerus eperlanus	Smelt		*Callionymus lyra*	Dragonet
	Lampetra fluviatilis	River lamprey		*Taurulus bubalis*	Long-spined sea scorpion
	Petromyzon marinus	Sea lamprey		*Pollachius virens*	Coley / Saithe / Coalfish
	Salmo salar	Atlantic salmon		*Trisopterus minutus*	Poor cod
	Salmo trutta	Brown / sea trout		*Melanogrammus aeglefinus*	Haddock
	Gasterosteus aculeatus	3-spined stickleback		*Crystallogobius linearis*	Crystal goby
	Liza ramada	Thinlip mullet		*Pomatoschistus lozanoi*	Lozano's goby
	Anguilla	European eel		*Liparis montagui*	Montagu's seasnail
Marine migrants (MM)	*Atherina presbyter*	Sand smelt		*Gaidropsarus mediterraneus*	Shore rockling
	Clupea harengus	Atlantic herring		*Mullus surmuletus*	Striped red mullet
	Sprattus	Sprat		*Glyptocephalus cynoglossus*	Witch flounder
	Cyclopterus lumpus	Lumpsucker		*Microstomus kitt*	Lemon Sole

Ecological guild	Species name	Common name	Ecological guild	Species name	Common name
	Gadus morhua	Atlantic cod		*Scomber scombrus*	Mackerel
	Merlangius merlangus	Whiting		*Scophthalmus rhombus*	Brill
	Pollachius	Pollack		*Scyliorhinus sp.*	Spotted dogfish
	Trisopterus luscus	Pouting / Bib		*Buglossidium luteum*	Solenette
	Ciliata mustela	5-bearded rockling		*Entelurus aequoreus*	Snake pipefish
	Dicentrarchus labrax	Sea bass		*Echiichthys vipera*	Lesser weever
	Chelon labrosus	Thick lipped grey mullet		*Chelidonichthys cuculus*	Red gurnard
	Liza aurata	Golden grey and	Fresh-water species (F)	*Cobitis taenia*	Spined loach
	Limanda	Dab		*Abramis brama*	Common bream
	Platichthys flesus	Flounder		*Alburnus alburnus*	Common bleak
	Pleuronectes platessa	Plaice		*Blicca bjoerkna*	Silver bream
	Scophthalmus maximus	Turbot		*Carassius auratus*	Goldfish
	Solea solea	Dover sole		*Rutilus rutilus*	Roach
	Chelidonichthys lucernus	Tub gurnard		*Scardinius erythrophthalmus*	Rudd
	Eutrigla gurnardus	Grey gurnard		*Squalius cephalus*	Chub

Ecological guild	Species name	Common name	Ecological guild	Species name	Common name
Estuarine residents (ES)	*Agonus cataphractus*	Hooknose / Pogge		*Tinca tinca*	Tench
	Ammodytes tobianus	Lesser sandeel		*Gobio gobio*	Gudgeon
	Myoxocephalus scorpius	Shorthorn sculpin		*Leuciscus cephalus*	Chub
	Raniceps raninus	Tadpole-fish		*Leuciscus*	Dace
	Aphia minuta	Transparent goby		*Rutilus x Alburnus alburnus*	Roach x Common bleak hybrid
	Pomatoschistus microps	Common goby		*Scardinius erythrophthalmus x Abramis brama*	Rudd x Common bream hybrid
	Pomatoschistus minutus	Sand goby		*Esox lucius*	Pike
	Liparis	Sea-snail		*Pungitius pungitius*	10-spined stickleback
	Pholis gunnellus	Rock gunnel		*Perca fluviatilis*	Perch
	Syngnathus acus	Greater pipefish		*Gymnocephalus cernuus*	Ruffe
	Syngnathus rostellatus	Lesser (Nillsons) pipefish			
	Zoarces viviparus	Viviparous blenny			

Source: Ref 9-58.

Marine migrant species

9.5.39 With respect to demersal fish considered to be marine migrant species, the Humber Estuary is considered to be an important nursery ground for several commercially important gadoids including whiting *Merlangius merlangus* and cod *Gadus morhua* (**Figure 9.3** (PEI Report, Volume III)). These species are typically the most abundant gadoids occurring in the Humber Estuary (Ref 9-28; Ref 9-58). Further information on the ecology of these species is provided in **Table 9.8**. Other gadoids commonly occurring include pouting *Trisopterus luscus* and pollack *Pollachius pollachius*.

9.5.40 A range of flatfish species are commonly recorded in the Humber Estuary region with flounder *Platichthys flesus* considered to be the most commonly occurring species. Nursery grounds for the commercially important Dover *sole Solea solea* and plaice *Pleuronectes platessa* occur in the region with these species also commonly occurring. Spawning grounds for Dover sole also occur in the region (**Table 9.8** and **Figure 9.3** (PEI Report, Volume III)). In addition, dab *Limanda limanda* and turbot *Scophthalmus maximus* are also recorded.

9.5.41 With respect to pelagic marine migrant species (free-swimming fish that inhabit the mid-water column), the clupeids sprat *Sprattus sprattus* and herring *Clupea harengus* are the most commonly occurring species. The Humber Estuary is considered to be nursery ground for herring (**Figure 9.3** (PEI Report, Volume III)). These pelagic species tend to have little association with the seabed and as a result are often distributed over widespread and indistinct grounds, often forming large shoals. Sea bass *Dicentrarchus labrax* is also frequently recorded in the Humber Estuary. Further information on the ecology of these species is provided in **Table 9.8**.

Table 9.8: Background information on the most commonly recorded marine migrant species occurring in the Humber Estuary

Species	Ecology
Whiting	In the Humber Estuary, whiting is recorded throughout most of the year with the highest abundances typically occurring in autumn. Most individuals recorded are juveniles, suggesting the Humber Estuary is predominantly used as a nursery ground.
Cod	In the Humber Estuary, the species occurs throughout most of the year but at lower frequency in the spring and summer. Cod is rarely recorded in intertidal and shallow subtidal habitats within the Humber Estuary. Most individuals recorded are juveniles, suggesting the Humber Estuary is predominantly used as a nursery ground. Spawning occurs offshore between January and April, peaking during February, with spawning grounds in the North Sea usually located in the pelagic zone at depths between 20 m and 100 m.
Flounder	Flounder occurs year-round in the Humber Estuary but with higher abundance typically recorded in late spring and summer. This species occurs in inshore waters to depths of 50 m and commonly reported using estuarine systems as nurseries. In the North Sea, the species generally spawn in spring in deeper marine waters, and larvae

Species	Ecology
	and early juveniles use selective tidal transport to migrate upstream to estuaries and rivers hence it may be regarded as semi-catadromous.
Dover sole	In the Humber Estuary, sole is recorded throughout most of the year with juvenile sole generally appearing in the Humber Estuary during the late spring and summer, after larvae and juveniles are transported here from adjacent coastal spawning areas by tidal currents. In the North Sea, the species generally reproduces in spring (March to late June, with a peak in April) in coastal waters, with spawning areas along the East coast of England from the Humber Estuary down to the Norfolk coast. In the North Sea, the nurseries are in shallow (< a few metres deep) sandy or muddy bottoms.
Plaice	Plaice occur throughout most of the year in the Humber Estuary with juveniles mainly recorded, suggesting the Humber Estuary is predominantly used as a nursery ground. Plaice spawn between January and April (with peak densities on spawning grounds in May). Spawning grounds in the UK are generally located at between 20 m and 40 m water depth with spawning grounds for plaice occurring in the marine areas near the mouth of the Humber Estuary. Plaice is a marine flatfish that uses estuarine habitats as nursery grounds. Plaice live mostly on sandy bottoms, although it can also be found on gravel and mud and on sandy patches in rocky areas, habitats and coastal zones as nursery grounds.
Dab	Dab occurring in the Humber Estuary are mainly juveniles, which suggests the estuary is predominantly as a nursery ground. Dab spawn from January to June in the North Sea) with adults migrating to deeper waters between May and September.
Herring and sprat	Both sprat and herring occur in the Humber Estuary throughout most of the year but with a lower frequency in the spring and higher frequency in autumn (herring) and winter (sprat). Most individuals of both species recorded are juveniles or young individuals. Sprat is very abundant in the shallow coastal and estuarine areas of the North Sea in winter before spawning offshore between May and August in the North Sea. Herring spawn in shoals on coarse sand, gravel, shells and small stones in shallow water between 15 to 40 m depth. Herring are demersal spawners, depositing their sticky eggs on coarse sand, gravel, small stones and rock. Young herring spend some time in the inshore areas before migrating offshore to join the adult population. Stocks that spawn in spring tend to use inshore spawning grounds whilst autumn and winter spawners tend to move offshore using the edges of ocean banks (e.g. around the Dogger Bank and off the Northumberland and Yorkshire coasts).
Sea bass	The occurrence of the sea bass in the Humber Estuary is typically sporadic. Data suggests that the estuary is predominantly used by juvenile/young stages, although the typically low frequency and abundance of the species suggest that the Humber Estuary is not an important nursery ground for sea bass.

Source: Ref 9-58; Ref 9-26; Ref 9-28; Ref 9-29.

Estuarine resident fishes

9.5.42 The sand goby *Pomatoschistus minutus* is the most frequently recorded goby species in the Humber Estuary, with common goby *P. microps* and the transparent goby *Aphia minuta* also occurring.

9.5.43 Sand gobies are frequently encountered in all areas of the estuary, but mainly in shallow intertidal areas in sandy and muddy habitats. Spawning occurs in shallow waters over an extended period, mostly during the spring and summer (sand goby spawn in summer while common goby spawn after their first winter between February and September, depending on the latitude), with multiple batches of eggs laid during this season (batch spawner).

9.5.44 Other estuarine resident species occurring in the Humber Estuary include lesser sandeel *Ammodytes tobianus*, hooknose *Agonus cataprachus*, tadpole fish *Raniceps raninus*, sea snail *Liparis liparis*, rock gunnel *Pholis gunnellus,* pipefish (greater pipefish *Sygnathus acus* and lesser pipefish *S. rostellatus*), and the viviparous blenny *Zoarces viviparus*.

Marine stragglers and freshwater species

9.5.45 Marine stragglers occur relatively infrequently with species recorded including the lesser weever *Echiichthys vipera* and dragonet *Callionymus lyra*.

9.5.46 The most commonly recorded freshwater species recorded in the Humber Estuary are roach *Rutilus rutilus* and common bream *Abramis brama* with other freshwater species recorded including and silver bream *Blicca bjoerkna* and rudd *Scardinius erythrophthalmus.* These species are typically recorded in the upper and mid sections of the Humber Estuary.

Diadromous migratory fish

9.5.47 Diadromous migratory fish (species migrating between freshwater and seawater) which occur in the Humber Estuary include salmonids (Atlantic salmon *Salmo salar* and sea trout *Salmo trutta*), lampreys (river lamprey *Lampretra fluviatilis* and sea lamprey *Petromyzon marinus*), European eel *Anguilla anguilla*, shads (allis shad *Alosa alosa* and twaite shad *Alosa fallax*) and European smelt *Osmerus eperlanus*. Of these species, European eel, European smelt and river lamprey have been the species most commonly recorded in sampling in the Humber Estuary (Ref 9-58). These species are all afforded protection under various legislation as described above.

9.5.48 Further information on the ecology and migration of these species is provided in **Table 9.9**.

Table 9.9: Background information on the ecology and distribution of diadromous migratory fish

Species	Ecology
European eel	European eel is a catadromous species which migrates to the marine environment (Sargasso Sea) to spawn. The larvae (leptocephali) then drift in the Gulf Stream and then North Atlantic Drift current for 2 to 3 years across the

Species	Ecology
	Atlantic Ocean to Europe and metamorphose into juveniles (elvers). The eels usually migrate into fresh water where they remain for many years. However, not all eels migrate into fresh water and some, predominantly males, remain in inshore coastal areas. The adults, commonly referred to as 'silver eels' during the spawning migration, leave river systems to return to the Sargasso Sea. The European Eel is widely distributed in the Humber catchment, although it is absent from the upper reaches of some rivers. In the Humber catchment, glass eels/elvers generally immigrate in spring and early summer, whereas the majority of silver eel emigrate in late summer and autumn. Eels are typically present in the Humber Estuary in the spring and summer. There is evidence that glass eels migrate upstream using 'Selective Tidal Stream Transport' (STST) whereby individuals with low locomotive capability, such as glass eels, move into the water column during flood tides to move up estuaries toward freshwater, typically remaining on or in the bottom substrate on ebb tides to avoid currents. Glass eel behaviour can be influenced by light levels, and although glass eels do migrate during the day there is an increase in activity during the night time, particularly in the first hours of darkness, when they also distribute closer to the surface. Some research suggests an increased abundance in glass eel catches during the new moon phase, but not the full moon, despite the fact that the tidal amplitude during both periods is similar. This could potentially be explained by the influence of light intensity on migration patterns. This effect of the lunar cycle and hence moonlight intensity is modulated by cloud cover and turbidity; therefore, one consequence is the fact that any lunar effect is not usually observed in highly turbid estuaries (Ref 9-128).
European smelt	The European smelt is a small anadromous species, widely distributed throughout the Atlantic and European waters, that migrates from estuaries and coastal waters into the lower reaches of rivers to spawn in early spring. Data suggests that the highest densities of smelt in the Humber Estuary occur in the spring and summer. The spawning migration starts in September to October, when mature fishes aggregate in estuaries to overwinter. Upriver migration starts in March to April when temperatures rise above 4 to 6°C and during rainy and stormy weather. Adult smelt generally enter the tidal Trent and Ouse from the Humber Estuary in early March and presumably return to the estuary after spawning.
River and sea lamprey	The river lamprey and the sea lamprey are both anadromous species, spawning in freshwater but completing part of their lifecycle in estuaries or at sea. The sea lamprey adult growth phase is short and lasts around two years. In this time, the species is parasitic, feeding on a variety of marine and anadromous fishes, including shad and salmon as well as herring, cod, haddock and basking sharks. Unlike sea lamprey, the growth phase of river lamprey is primarily restricted to estuaries. River lamprey have been frequently recorded in the Humber Estuary, with the Ouse catchment believed to support one of the most important river lamprey populations in the UK. In the Humber basin, river lamprey mainly enters the rivers from the estuary in autumn and then spawn in April. Sea lamprey spawning is almost entirely restricted to the Ouse catchment, principally the Rivers Ouse, Swale, Ure and Wharfe. The spawning migration of sea lamprey usually takes place in April and May when the adults start to migrate back into fresh water. The upstream migration of river lamprey takes place almost

Species	Ecology
	exclusively at night, with adults being sedentary and resting under rocks and riverbanks during the day.
Shads	The twaite and allis shad are anadromous species. Mature allis shad, having spent most of their lives in the sea stop feeding and move into the estuaries of large rivers, migrating into fresh water during late spring (April to June). Adult twaite shad stop feeding at sea and gather in the estuaries of suitable rivers in early summer (April and May), moving upstream to spawn from mid-May to mid-July. Within the Humber Estuary, most records of allis shad were juveniles while twaite shad adults.
Atlantic salmon and sea trout	Atlantic salmon and sea trout are anadromous species which migrate to freshwaters to spawn, whilst spending much of their life in the marine environment. They spawn in upper reaches of rivers, where they live for one to three years before migrating to sea as smolts. Atlantic salmon and sea trout smolts move out of the rivers and migrate downstream to the sea in spring, with the main movements occurring between April and June. At sea, salmon grow rapidly and after one to three years return to their natal river to spawn. The majority of adult salmon return to their natal rivers in autumn, although a small proportion returns in the spring and summer. In the Humbler catchment, Atlantic salmon has been mainly recorded from the upper reaches of the Ouse with brown/sea trout widespread in the upper reaches of the Humber catchment. In the Humber Estuary, most Atlantic salmon and sea trout have been recorded in the spring months between April and June and have been of smolt size.

Sources, Ref 9-128; Ref 9-128; Ref 9-129.

9.5.49 In summary**,** existing data suggests that the Humber Estuary supports a wide range of fish species including commonly occurring estuarine species and migratory species including diadromous fish. The Humber Estuary is also considered an important nursery ground for a range of commercially important fish species.

Immingham area

9.5.50 Fish data collected as part of intertidal fyke net and subtidal beam trawl surveys undertaken in May/June 2010 at sites located approximately 3 to 4 km from the Project (between the Humber Sea Terminal and the Port of Immingham) has also been reviewed; despite the vintage of these data, they provide an indication of species which may be present (Ref 9-24)[4].

9.5.51 The intertidal sampling (fyke netting) catch was dominated by flatfish species (flounder and sole) which consisted of 1+group flounder (born the year before) and mostly 0+ group sole, which suggested the area is used as a flatfish nursery. Single individuals of pollock, five-bearded rockling *Ciliata Mustela* and sand goby

[4] A fyke net is a type of fish trap. It consists of long cylindrical netting bag usually with several netting cones fitted inside the netting cylinder to make entry easy and exit difficult. This fishing methods typically target demersal fish species.

were also recorded (due to the small size of sand goby, this fish is normally misrepresented in fyke net catches).

9.5.52 Sand gobies and sole were the most abundant species recorded in the subtidal sampling (beam trawls) with other species recorded in lower abundances including whiting, five-bearded rockling and river lamprey. Sole caught in the subtidal survey were significantly larger than the specimens from the fyke nets. This is consistent with earlier research by Cefas that analysed annual 2 m beam trawl and 1.5 m push net survey data from the period 1981 to1995 and found that 0-group sole were highest in the 2 m to 5.9 m depth band (Ref 9-64).

9.5.53 The results of the most recently available Environment Agency TraC fish monitoring for the sites nearest the Project (seine netting/beam trawls at Foulholme Sands and otter trawls at Burcom) are summarised in **Table 9.10**. Beach seine netting targets both demersal and pelagic species occurring in shallow inshore locations. Beam and otter trawls target demersal species[5]. The Foulholme Sands surveys were undertaken twice a year in the spring and autumn with the Burcom surveys annually in the early winter. These monitoring sites are located approximately 3 km to 5 km from the Project and are shown in **Figure 9.4** (PEI Report, Volume III). Data was available up to 2017 for Foulholme Sands and up to 2019 for Burcom (Ref 9-27).

Table 9.10: The total number of fish caught in fish surveys undertaken at Burcom and Foulhome Sands between 2013 and 2019

Species	Burcom Otter Trawl*	Foulhome Sands Beam Trawl**	Foulhome Sands Seine Net***
3-spined stickleback	-	1	41
5-bearded rockling	7	-	1
Bullrout / Short-spined sea scorpion	6	-	-
Cod	150	-	-
Common goby	7	-	8
Dab	48	-	
Dover sole	515	38	125
Dragonet	-	1	-
Flounder	81	48	63
Herring	14	4	205

[5] These bottom trawls would only accidentally capture pelagic species (such as sprat or sea bass).

Species	Burcom Otter Trawl*	Foulhome Sands Beam Trawl**	Foulhome Sands Seine Net***
Hooknose / Pogge	7	4	-
Lesser (Nillsons) pipefish	-	53	222
Lesser sandeel	-	1	-
Lesser weever	-	-	1
Plaice	4	114	1303
River lamprey	1	-	-
Sand goby	1220	21	752
Sea bass	-	1	35
Sea-snail	21	-	
Smelt	3	-	74
Sprat	9	-	20
Thin lipped grey mullet	-	-	9
Thornback ray / Roker	2		-
Turbot	-	-	4
Viviparous blenny	1	-	6
Whiting	164	10	45

* Surveys undertaken between 2013 and 2019.

** Surveys undertaken between 2014 and 2017.

*** Surveys undertaken between 2013 and 2017.

9.5.54 In summary, the most abundant species recorded in the surveys summarised in **Table 9.10** were sand gobies, the flatfish species plaice and Dover sole, the pelagic species herring and the gadoids whiting and cod. Other commonly occurring species recorded included the diadromous European smelt, flounder, 3-spined stickleback, dab and sprat. The results are consistent with data for the wider Humber Estuary region (described above) which suggests that these species are some of the most commonly occurring species in the region. In addition, of note was a single individual River lamprey recorded in the Burcom Otter Trawl.

9.5.55 While these surveys do not overlap specifically with the Project, they are considered broadly representative of the fish assemblage that could be present

within the dredge footprint and surrounding local area. This is because the surveys have used a variety of techniques to target different habitats within both the intertidal and subtidal. The TrAC surveys are also relatively contemporary and cover a range of seasons.

Marine mammals

Humber Estuary overview

Seals

9.5.56 The most commonly occurring marine mammals recorded in the Humber Estuary region are seals with populations of both grey seal *Halichoerus grypus* and common (harbour) seal *Phoca vitulina* occurring. Further information about the abundance and distribution of these species is provided below followed by a description of cetacean (whale, dolphin and porpoise) species occurring in the region.

9.5.57 The intertidal area at Donna Nook is the main haul out site in the region and is an important breeding ground for grey seals. This colony is located over 25 km from the Project at the mouth of the Humber Estuary. In 2019, there were an estimated 67,789 grey seal pups born in Britain (Ref 9-65) with approximately 3 % of the pup production occurring at Donna Nook. Breeding occurs once a year between October and December and the vast majority of seals in this colony breed at Donna Nook, with a few seals breeding on Skidbrooke Ridge, south of Donna Nook. Peak grey seal pup numbers in winter 2021/22 and 2020/21 at Donna Nook consisted of two ,122 and 2,214 seals respectively with numbers having increased substantially in recent years from under 100 pups born annually in the 1980s (see **Figure 9.5** (PEI Report, Volume III)).

9.5.58 The intertidal mudflats also provide an important habitat throughout the year for grey seals to haul out or rest, particularly during the spring when all grey seals (except young born the previous year) are moulting. Aerial seal counts undertaken in August 2021 recorded 3,897 grey seals hauled out at Donna Nook. Total numbers at this colony have increased from the low hundreds recorded in the late 1990s and early 2000s to counts over 4000-5,000 seals in more recent years (Ref 9-65) (see **Figure 9.6** (PEI Report, Volume III)).

9.5.59 Grey seals can undertake wide ranging seasonal movements over several thousand kilometres (Ref 9-66; Ref 9-34; Ref 9-35). However, while grey seals may range widely between haul out sites, tracking has shown that most foraging probably occurs within 100 km of a haul-out site (Ref 9-36). Seals tagged at Donna Nook were recorded undertaking wide ranging movements in the outer Humber Estuary and approaches as well as more widely in the North Sea (Ref 9-35). This is reflected in high predicted at-sea densities of grey seals in the approaches to the Humber Estuary (Ref 9-34).

9.5.60 The Humber Estuary region also supports a small population of common seal. As for the grey seal, Donna Nook is also the key haul out site for common seals. A total of 122 common seals were recorded as part of annual aerial monitoring in the region in August 2021. Since the 1990s numbers have generally fluctuated

between 100 and 400 counts annually in the region (Ref 9-36). Common seals typically forage within 40 km to 50 km of haul out sites (Ref 9-36).

Cetaceans

9.5.61 While over ten species of cetacean have been recorded in the southern and central North Sea, only harbour porpoise *Phocoena phocoena* is considered as regularly occurring throughout most of the year (Ref 9-30; Ref 9-67; Ref 9-33).

9.5.62 Near to the Humber Estuary, high densities of harbour porpoise have been recorded offshore from the Lincolnshire coast and the Holderness Coast (Ref 9-38; Ref 9-47). Harbour porpoise are also frequently recorded foraging in the Humber Estuary region with over 2,000 sightings since 2000 (Ref 9-30; Ref 9-32; Ref 9-31). Peak sightings and numbers occur in August, September and October. Although porpoises in the North Sea can give birth in any month of the year, breeding is typically seasonal with most births in June or July and a peak in mating in August (Ref 9-30).

9.5.63 Other cetacean species recorded in the Humber Estuary region more rarely include bottlenose dolphin *Tursiops truncatus*, common dolphin *Delphinus delphis*, white-beaked dolphin *Lagenorhynchus albirostris* killer whale *Orcinus orca* and minke whale *Balaenoptera acutorostrata* (Ref 9-30); Ref 9-31).

Immingham area

9.5.64 Marine mammal survey data or sighting records for the Immingham area are limited. However, given that seals (particularly grey seals) are regularly recorded foraging in the Humber Estuary, this species would be expected to occur relatively frequently in this area. For example, approximately 10 to 15 grey seals were 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 Ref 9-48. This haul out site is located approximately 4 km north east from the Project 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 Project.

9.5.65 Harbour porpoises have also been regularly recorded foraging in this section of the Humber Estuary (Ref 9-30) (see **Figure 9.7** (PEI Report, Volume III)). This includes observations of a harbour porpoise foraging approximately 2 km from the Project in the mid channel, offshore from Immingham during the project specific benthic surveys as detailed in Ref 9-48.

Future Baseline

9.5.66 In the absence of the Project, the current marine coastal processes would remain the same as described in the preliminary physical processes assessment (**Chapter 16: Physical Processes**).

9.5.67 Marine species are likely to become increasingly vulnerable to anthropogenic pressures in the future due to the predicted effects of climate change and ocean acidification in combination with more local pressures. The 2020 MCCIP report card (Ref 9-49) highlighted the following changes to marine ecology receptors

could potentially occur during the operational phase of the project as a result of climate change:

a. Sea-level rise could result in deeper waters and larger waves reaching saltmarsh and other intertidal habitats, causing erosion at the seaward edge;

b. Changes in patterns of rainfall or temperature changing vegetation composition of coastal saltmarsh communities;

c. Marine communities around the UK altering as ocean acidification increases;

d. Changing sea temperatures resulting in range shifts for both benthic species and mobile species (such as fish, marine mammals). This could result in a decline of some cold-water species around certain parts of the UK and an increase in the prevalence of non-native species;

e. Changing temperatures affecting spawning in some marine species as well as the timings of migrations;

f. Coastal waterbirds showing north-easterly shifts in the winter distributions in Europe; and

g. Changes in prey distribution and availability, resulting in range shifts in some regional populations of marine mammals, fish and seabirds.

9.5.68 Data suggests that ecological changes linked to climate change (such as range shifts) are already occurring although there is currently a high degree of uncertainty with respect to predicting the magnitude of potential effects in the future.

9.6 Development Design and Impact Avoidance

Embedded Mitigation Measures

9.6.1 The Project has been designed, as far as possible, to avoid and minimise impacts and effects to marine ecology through the process of design development, and by embedding mitigation measures into the design, such as minimising the dredge requirements as far as possible.

Standard Mitigation Measures

9.6.2 A number of measures will be undertaken to manage commonly occurring environmental effects. Although these are not likely to alter the assessment conclusions, they are considered to be standard good practice. These are as follows:

a. Even disposal deposition of dredged material: Targeting disposal loads in the central/deeper area of the disposal sites to reduce depth reductions. This will minimise the initial reduction in water depth and any environmental changes at the disposal sites;

b. Following biosecurity management procedures: Biosecurity control measures during construction will be included within the outline Construction Environmental Management Plan (CEMP) and the Applicant's existing biosecurity management procedures will be followed during operation; and

c. Adhering to environmental management best practice: The potential risk from accidents and spillages/leaks during construction will be avoided or minimised by ensuring that the construction methods, proposed design and the contractual arrangements follow pollution prevention legislation and environmental management best practice.

9.7 Potential Impacts and Effects

9.7.1 The preliminary assessment has identified potential likely significant effects on marine ecology receptors as a result of the construction and subsequent operation of the Project.

9.7.2 The preliminary physical processes assessment (**Chapter 16: Physical Processes**), water and sediment quality assessment (**Chapter 17: Marine Water and Sediment Quality**) and underwater noise assessment (**Appendix 9.B** (PEI Report, Volume IV)) have informed the outcomes of the marine ecology assessment.

9.7.3 Potential impacts on features of internationally designated sites (SACs, SPAs and Ramsar sites) have been assessed in **Section 9.5** and will also be assessed within the HRA in accordance with the HRA screening report (**Appendix 9.C** (PEI Report, Volume IV)).

9.7.4 It is noted that the Killingholme Haven Pits Site SSSI which is located approximately 6 km away from the Project could be functionally linked to the mudflat habitat in the Project footprint with local populations of species such as Dunlin and Black-tailed Godwit potentially utilising both areas. However, Killingholme Haven Pits is considered too distant to be impacted directly by the Project (such as through potential disturbance effects). Based on the predicted magnitude of potential effects and proposed mitigation, indirect impacts on the SSSI (e.g. changes in local population levels resulting from changes in distribution or mortality) are also expected to be negligible.

9.7.5 The Lagoons SSSI is located approximately 20 km from the Project with Little Tern a notified feature of the SSSI. Data suggests that this species forages within 5 km of nesting sites (Ref 9-57) with this species considered very rare within the Immingham area. On this basis, this notified feature will not overlap with any potential direct or indirect changes resulting from the construction and operational activities associated with the Project which are limited to within the vicinity of the Port of Immingham.

9.7.6 The nearest MCZ (Holderness Inshore) is located approximately 20 km from the Project and does not overlap with the zone of influence. Furthermore, there are no mobile FOCI that could overlap with any of the marine effects resulting from the Project. Overall, therefore, there is considered to be no potential for direct or indirect impacts on FOCI at this site. On this basis an MCZ Assessment is not considered to be required.

9.7.7 Cumulative impacts on marine ecology receptors that could arise as a result of other coastal and marine developments and activities in the Humber Estuary combined with the Project are considered as necessary as part of the cumulative

impacts and in-combination effects assessment (**Chapter 25: Cumulative and In-Combination Effects**).

Construction

9.7.8 This section contains a preliminary assessment of the potential impacts to marine ecology receptors as a result of the construction phase of the Project. Potential effects during the construction phase that are considered relevant are reviewed in **Table 9.10**. It should be noted that the table includes the rationale for the scoping in or out of individual pathways for further assessment. It should be noted that the construction of the Project may be completed in a single stage, or it may be sequenced such that the construction of Berth 2 takes place at the same time as operation of Berth 1 (see **Chapter 2: The Project)**. However, all capital dredging (and associated disposal activity) will be undertaken together at one time, before operation of Berth 1 commences. Therefore, for all impact pathways relating to capital dredge or dredge disposal, the assessment will not be altered by a single or sequenced construction period. Furthermore, in the case of a sequenced construction, the overall duration of piling will, however, be extended. However, there will be no change in the overall peak levels of underwater noise generated by the construction of the two berths at once versus a sequenced construction (i.e., the magnitude of change). Therefore, the underwater noise assessment for benthic habitats, fish and marine mammals as presented below is considered the worst-case scenario and will not be altered by a sequenced construction period.

Table 9.11: Potential effects during construction scoped in / out of further detailed assessment

Receptor	Impact Pathways/ Potential Effects	Project activity	Included in assessment?	Justification
Benthic habitats and species	Direct loss of intertidal and subtidal habitats and species as a result of the piles	Piling	Yes	Piling would result in the small loss of subtidal and intertidal habitat. This impact pathway has, therefore, been scoped into the assessment.
	Direct changes to benthic habitats and species as result of seabed removal during dredging	Capital dredge	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. This impact pathway has, therefore, been scoped into the assessment.
		Dredge disposal	N/A	This pathway relates to changes in habitat resulting directly from seabed removal and is, therefore, not considered relevant to the dredge disposal activity. Potential effects resulting from sediment deposition at the disposal site are discussed in the row below.
	Direct changes to benthic habitats and species as a result of sediment deposition	Piling	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 has, therefore, been scoped out of the assessment.

Receptor	Impact Pathways/ Potential Effects	Project activity	Included in assessment?	Justification
		Capital dredge	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). This impact pathway has, therefore, been scoped into the assessment.
		Dredge disposal	Yes	Dredge disposal will result in the deposition of sediments which has the potential to cause physical disturbance and smothering of seabed habitats. This impact pathway has, therefore, been scoped into the assessment.
	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)	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. This impact pathway has, therefore, been scoped into the assessment.
		Dredge disposal	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

Receptor	Impact Pathways/ Potential Effects	Project activity	Included in assessment?	Justification
				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. This impact pathway has, therefore, been scoped into the assessment.
	Changes in water and sediment quality	Piling	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 has, therefore, been scoped out of the assessment.
		Capital dredge	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. This impact pathway has, therefore, been scoped into the assessment.
		Dredge disposal	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. This impact pathway has, therefore, been scoped into the assessment.
		Surface water drainage	No	Standard measures to control surface water run-off during construction are embedded within the Project design for legislative compliance, and therefore it is very unlikely that

Receptor	Impact Pathways/ Potential Effects	Project activity	Included in assessment?	Justification
				contaminated run-off would enter the Humber Estuary. This impact pathway has, therefore, been scoped out of the assessment.
	Underwater noise	Piling	Yes	Underwater noise generated by piling has the potential to affect benthic species. This will require further assessment and has, therefore, been scoped in.
		Capital dredge	Yes	Underwater noise generated by dredging has the potential to affect benthic species. This will require further assessment and has, therefore, been scoped in.
		Dredge disposal	Yes	Underwater noise generated by the movement of the dredger to and from the disposal site has the potential to affect benthic species if this disposal option is adopted. This will require further assessment and has, therefore, been scoped in.
	The potential introduction and spread of non-native species	Construction of marine infrastructure	Yes	Non-native species have the potential to be transported into the local area as a result of construction activity. This impact pathway has, therefore, been scoped into the assessment.
		Capital dredge	Yes	Non-native species have the potential to be transported into the local area on the hulls of dredging vessels. Non-native invasive species also have the potential to be transported via vessel ballast water. This impact pathway has, therefore, been scoped into the assessment.
		Dredge disposal	Yes	Non-native species have the potential to be transported into the local area on the hulls of dredging vessels. Non-native invasive species also have the potential to be transported via

Receptor	Impact Pathways/ Potential Effects	Project activity	Included in assessment?	Justification
				vessel ballast water. This impact pathway has, therefore, been scoped into the assessment.
	Damage to sensitive habitats as a result of changes in air quality.	Road traffic emissions	No	The predicted number of construction vehicle movements is lower than the IAQM and EPUK screening guidance (see **Chapter 6: Air Quality**), below which a road traffic impact is unlikely to contribute to a significant effect on local air quality. This impact pathway has, therefore, been scoped out of the assessment.
		Construction vessel emissions	No	The assessment has considered a scenario of peak construction vessel operation (see **Chapter 6: Air Quality).** Given the limited number of construction vessel emissions sources, the frequency of operation and distance between source and sensitive receptors, it is considered highly unlikely that this source could contribute to a significant effect on local air quality. This impact pathway has, therefore, been scoped out of the assessment.
Fish	Direct loss or changes to fish populations and habitat	Piling	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 Project. However, the direct footprint of the piling only covers a highly localised area with the mobile nature of fish allowing them to utilise nearby areas. This impact pathway has, therefore, been scoped out of the assessment.
		Capital dredge	Yes	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). Backhoe dredging can also directly remove fish and fish eggs in the bucket. In addition, capital dredging has the potential to result in seabed

Receptor	Impact Pathways/ Potential Effects	Project activity	Included in assessment?	Justification
				disturbance and smothering of seabed habitats and species. These changes have the potential to impact on fish species through potential changes in prey resources and the quality of foraging, nursery and spawning habitats. This impact pathway has, therefore, been scoped into the assessment.
		Dredge disposal	Yes	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. These changes have the potential to impact on fish species through potential changes in prey resources and the quality of foraging, nursery and spawning habitats. This impact pathway has, therefore, been scoped into the assessment.
	Indirect changes to seabed habitats for fish	Piling	No	Piling 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, such effects will be negligible and highly localised and will cause no direct changes to fish habitat. This impact pathway has, therefore, been scoped out of the assessment.
		Capital dredge	No	The capital dredge 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 **Chapter 16: Physical Processes**), negligible changes in estuary processes are predicted. The predicted changes are not expected to modify existing subtidal habitat types found in the area. Indirect effects on fish habitats (feeding, spawning and nursery areas) are, therefore, considered to be negligible. On

Receptor	Impact Pathways/ Potential Effects	Project activity	Included in assessment?	Justification
				this basis, this pathway has been scoped out of the assessment.
		Dredge disposal	No	Dredge disposal 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 **Chapter 16: Physical Processes**), only minor changes in flow rates and subtidal seabed morphology are predicted which are not expected to modify existing subtidal habitat types found in the area (i.e. mobile sand habitats characterised by an impoverished infaunal assemblage). Given the offshore location of the disposal site, no changes in wave regime are predicted. Indirect effects on fish habitats (feeding, spawning and nursery areas) are, therefore, considered to be negligible. On this basis, this pathway has been scoped out of the assessment.
	Changes in water and sediment quality	Piling	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 are considered highly unlikely to produce adverse effects in any fish species. This assessment has been made based on preliminary numerical modelling of physical processes (see **Chapter 16: Physical Processes**) and the water and sediment quality assessment (**Chapter 17: Marine Water and Sediment Quality**). The potential for accidental spillages will also be negligible during construction through following established industry

Receptor	Impact Pathways/ Potential Effects	Project activity	Included in assessment?	Justification
				guidance and protocols. This impact pathway has, therefore, been scoped out of the assessment.
		Capital dredge	Yes	Changes in water quality during capital dredging could impact fish species through an increase in SSC and the release of toxic contaminants bound in sediments. This impact pathway has, therefore, been scoped into the assessment.
		Dredge disposal	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 fish species. This impact pathway has, therefore, been scoped into the assessment.
	Underwater noise	Piling	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 Project. This impact pathway has, therefore, been scoped into the assessment.
		Capital dredge	Yes	Elevated underwater noise and vibration levels caused by the action of the dredger could potentially affect fish. This impact pathway has, therefore, been scoped into the assessment.
		Dredge disposal	Yes	Underwater noise and vibration levels caused by the movement of the dredger to and from the disposal site could potentially affect fish. This impact pathway has, therefore, been scoped into the assessment.

Receptor	Impact Pathways/ Potential Effects	Project activity	Included in assessment?	Justification
Marine mammals	Direct loss or changes in marine mammal foraging habitat	Construction (piling, capital dredge and dredge disposal)	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 Project only covers a highly localised area that constitutes a negligible fraction of the known ranges of local marine mammal populations. This impact pathway has, therefore, been scoped out of the assessment.
	Changes in water and sediment quality	Piling	No	The negligible, highly localised and temporary changes in suspended sediment levels (as described in more detail in **Chapter 16: Physical Processes**) and related changes in sediment bound contaminants and dissolved oxygen (as described in **Chapter 17: Marine Water and Sediment Quality**) 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 has, therefore, been scoped out of the assessment.
		Capital dredge	No	The plumes resulting from dredging are expected to have a relatively minimal and local effect on SSC in the vicinity of the Project (as described in more detail in **Chapter 16: Physical Processes**). Marine mammals are well adapted to turbid conditions and, therefore, not sensitive to the scale of changes in SSC predicted during capital dredging (Ref 9-50). Given the limited extent of sediment dispersal significant elevations in water column contamination are unlikely. This will be confirmed following analysis of the uplift in contaminant concentrations in the water column once

Receptor	Impact Pathways/ Potential Effects	Project activity	Included in assessment?	Justification
				sediment sampling and analysis has been carried out. 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) (Ref 9-50). Furthermore, potential for accidental spillages will also be negligible during all phases through the application of established industry guidance and protocols. The potential for water quality impacts to marine mammals has, therefore, been scoped out of the assessment.
		Dredge disposal	No	The plumes resulting from dredge disposal are expected to have a relatively minimal and local effect on SSC (as described in more detail in **Chapter 16: Physical Processes**). Marine mammals are well adapted to turbid conditions and, therefore, not sensitive to the scale of changes in SSC predicted during disposal (Ref 9-50). Given the limited extent of sediment dispersal significant elevations in water column contamination are unlikely. This will be confirmed following analysis of the uplift in contaminant concentrations in the water column once sediment sampling and analysis has been carried out. 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) (Ref 9-50).

Receptor	Impact Pathways/ Potential Effects	Project activity	Included in assessment?	Justification
				Furthermore, potential for accidental spillages will also be negligible during construction through the application of established industry guidance and protocols. The potential for water quality impacts to marine mammal has therefore been scoped out of the assessment.
	Collision risk	Construction, dredging and dredge disposal	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 (Ref 9-51). 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 (Ref 9-52; Ref 9-53). 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 (Ref 9-53). 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 has, therefore, been scoped out of the assessment.

Receptor	Impact Pathways/ Potential Effects	Project activity	Included in assessment?	Justification
	Underwater noise	Piling	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 Project. This impact pathway has, therefore, been scoped into the assessment.
		Capital dredge	Yes	Elevated noise and vibration levels caused by the action of the dredger could potentially affect marine mammals by inducing adverse behavioural reactions. This impact pathway has, therefore, been scoped into the assessment.
		Dredge disposal	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. This impact pathway has, therefore, been scoped into the assessment.
	Visual disturbance of hauled out seals	Construction, dredging and dredge disposal	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 benthic surveys as detailed in Ref 9-48. This haul out site is located approximately 4 km north east from the Project 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 Project. Seals which are hauled out on land, either resting or breeding, are considered particularly sensitive to visual disturbance (Ref 9-68).

Receptor	Impact Pathways/ Potential Effects	Project activity	Included in assessment?	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 (Ref 9-69; Ref 9-70; Ref 9-71; Ref 9-72). 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 (Ref 9-73). 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 (Ref 9-74). Based on this evidence, seals hauled out on the intertidal habitats of Sunk Island (located on the opposite bank to the Project) are out of the zone of influence of any potential visual disturbance effects as a result of dredging, dredge disposal or construction activity. The potential for disturbance to hauled out seals has, therefore, been scoped out of the assessment.

Benthic Habitats and Species

9.7.10 This section contains a preliminary assessment of the potential impacts to benthic ecology receptors as a result of the construction phase of the Project. The following impact pathways have been assessed:

a. Direct loss of intertidal habitat as a result of the piles;

b. Direct loss of subtidal habitat as a result of the piles;

c. Changes to benthic habitats and species as result of the removal of seabed material during dredging;

d. Changes to habitats and species as a result of sediment deposition during dredging and dredge disposal;

e. Indirect loss or change to seabed habitats and species as a result of changes to hydrodynamic and sedimentary processes during marine works (capital dredging and piles) and dredge disposal;

f. Changes in water and sediment quality during capital dredging and dredge disposal;

g. Underwater noise and vibration during piling, capital dredging and dredge disposal; and

h. Introduction and spread of non-native species.

Direct loss of intertidal habitat as a result of the piles

9.7.11 The piles will cause a direct loss of 0.017 ha of intertidal mudflat habitat.

9.7.12 The combined worst case intertidal habitat loss as a result of the piling represents approximately 0.000048 % the Humber Estuary SAC and approximately 0.000186 % of the 'mudflats and sandflats not covered by seawater at low tide' feature of the Humber Estuary SAC[6].

9.7.13 This loss also represents 0.000046 % of the Humber Estuary SPA/Ramsar[7]. When considering this in the context of intertidal area, the area of loss represents approximately 0.000196 % of intertidal foreshore habitats[8] and approximately 0.000274 % of mudflat[9] within the SPA.

9.7.14 This habitat loss is therefore negligible in the context of the Humber Estuary SAC, SPA and Ramsar.

[6] Based on the extents given in the Standard Data Form on the JNCC website (Ref 9-39)
[7] Based on the extents given in the Standard Data Form on the JNCC website (Ref 9-40)
[8]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
[9] 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).

9.7.15 The loss of intertidal habitat due to piling will also be highly localised and considered *de minimis* in extent. The loss is also considered to be 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. Potential effects of direct intertidal habitat loss on coastal waterbirds are considered in **Chapter 10: Ornithology**.

9.7.16 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Direct loss of subtidal habitat as a result of the piles

9.7.17 Piling in the subtidal area will result in the direct loss of 0.035 ha of seabed habitat. This habitat represents approximately 0.000096 % of the Humber Estuary SAC.

9.7.18 The project-specific subtidal survey (**Section 9.3** and **Appendix 9.A** of this PEI Report, Volume IV) recorded a highly impoverished assemblage characterised polychaetes (such *Nephtys* spp, *Streblospio shrubsolii* and *Scoloplos armiger*), nematodes, oligochaetes *Tubificoides* spp and crustacean *Diastylis rathkei)*.

9.7.19 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 (Ref 9-23; Ref 9-24; Ref 9-22).

9.7.20 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Changes to benthic habitats and species as result of the removal of seabed material during dredging

9.7.21 Dredging causes a direct physical removal of subtidal sediments, causing a modification to the existing subtidal habitat. 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.

9.7.22 The capital dredge will remove approximately 100,000 m^3 of material over a maximum area of approximately 45,000 m^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).

9.7.23 Following the capital dredge, it is likely that the dredge pocket would provide similar habitat to that under pre-dredge conditions. This will be confirmed by sediment sampling carried out in line with OSPAR[10] requirements and subsequent analysis as part of the Physical Processes assessment for the ES.

9.7.24 The project-specific subtidal survey (**Section 9.3** and **Appendix 9.A** (PEI Report, Volume IV)) recorded an impoverished benthic community which is likely to

[10] 'OSPAR' relates to the Convention for the Protection of the Marine Environment of the North-East Atlantic.

reflect the existing high levels of physical disturbance in the area due to strong tidal currents and sediment movement.

9.7.25 Samples were characterised by polychaetes (such *Nephtys* spp, *Streblospio shrubsolii* and *Scoloplos armiger*), nematodes, oligochaetes *Tubificoides* spp and crustacean *Diastylis rathkei.* 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 (Ref 9-75; Ref 9-76; Ref 9-77). 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 (Ref 9-23; Ref 9-24; Ref 9-22). Subtidal habitats in areas around the Port of Immingham are considered to be typically of limited ecological value.

9.7.26 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

9.7.27 It should be noted that this assessment specifically relates to the effects of the capital dredge. The frequency of dredging required as part of the proposed maintenance dredging programme, however, will mean that the seabed in the berths is likely to be disturbed on a periodic basis once the Project is operational. Changes to benthic habitats and species as result of the removal of seabed material during maintenance dredging is considered in **Table 9.12**.

Changes to habitats and species as a result of sediment deposition during dredging and dredge disposal

Capital Dredging

9.7.28 Sediment changes that are predicted to occur as a result of the capital dredge are presented at this preliminary stage in **Chapter 16: Physical Processes**. In summary, however, preliminary conclusions are that maximum siltation as a result of the capital dredge within about 500 m up and down the estuary from the edge of the dredge pocket is predicted to be 3 mm. Beyond this area, 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.

9.7.29 The project-specific subtidal survey (**Section 9.3** and **Appendix 9.A** of this PEI Report, Volume IV) recorded highly impoverished assemblage characterised polychaetes (such *Nephtys* spp, *Streblospio shrubsolii* and *Scoloplos armiger*), nematodes, oligochaetes *Tubificoides* spp and crustacean *Diastylis rathkei*. All the species recorded were considered commonly occurring and not protected.

9.7.30 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 to 2 years and for some species within a few months (Ref 9-75; Ref 9-76; Ref 9-77).

9.7.31 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Disposal

9.7.32 The requirement for disposal of dredged material at sea associated with the Project would be fulfilled at licensed disposal sites HU056 and HU060 (see **Chapter 2: The Project**).

9.7.33 A preliminary assessment of the sediment changes that are predicted to occur as a result of the capital dredging disposal is presented in **Chapter 16: Physical Processes**. 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 1mm to 2 mm.

9.7.34 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. This is reflected in a generally impoverished assemblage at both disposal sites. In addition millions of wet tonnes of dredge sediment are disposed of at HU060 annually which will also cause some disturbance due to sediment deposition.

9.7.35 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 (Ref 9-78; Ref 9-75; Ref 9-76; Ref 9-77; Ref 9-79). On this basis, any effects are considered to be temporary and short term.

9.7.36 In summary, deposition in the wider area surrounding the disposal ground is expected to be in the order of millimetres. Sedimentation of this scale is unlikely to result in significant smothering effects to most faunal species with recoverability expected to be high.

9.7.37 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Indirect loss or change to seabed habitats and species as a result of changes to hydrodynamic and sedimentary processes

Marine works

9.7.38 A preliminary assessment of the hydrodynamic and sediment regime changes that are predicted to occur as a result of the marine works are presented in **Chapter 16: Physical Processes**. 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.

9.7.39 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. This will result in a potential indirect loss in 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).

9.7.40 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[11].

9.7.41 The predicted intertidal loss also consists of a very narrow strip on the lower shore around the sublittoral fringe and it is considered that this loss in mudflat extent 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.

9.7.42 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Disposal

9.7.43 A preliminary assessment of the hydrodynamic and sediment regime changes that are predicted to occur as a result of the capital dredging disposal is presented in **Chapter 16: Physical Processes**.

9.7.44 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.

9.7.45 These changes are unlikely to result in any significant changes to local sediment transport in the region although some localised changes to seabed bathymetry and morphology could occur.

9.7.46 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).

9.7.47 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

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

Changes in water and sediment quality during dredging and dredge disposal

Capital dredge

Elevated suspended sediment concentrations

9.7.48 The changes in SSC that are predicted to occur as a result of the capital dredge are presented at this preliminary stage **Chapter 16: Physical Processes**. In summary, the increased concentrations arising from the capital dredge will be of a lower magnitude and persist for a shorter distance (and time) than that from disposal activity which is summarised below.

9.7.49 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 (Ref 9-80; Ref 9-81). The estuarine benthic communities recorded on mudflats and the shallow mud in the region are considered tolerant to this highly turbid environment (Ref 9-75; Ref 9-76; Ref 9-77). The predicted SSCs are within the range that can frequently occur naturally and also as a result of ongoing dredge and disposal activity (**Chapter 16: Physical Processes**).

Release of contaminants

9.7.50 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).

9.7.51 The site-specific sediment sampling and analysis that will be undertaken to inform the Marine Water and Sediment Quality assessment (**Chapter 17: Marine Water and Sediment Quality**) has not been undertaken at this preliminary stage.

9.7.52 However, based on existing evidence on the level of contamination in sediments within the vicinity of the Project, the overall level of contamination in the proposed dredge area is likely to be low.

9.7.53 On this basis, the uplift in dissolved contaminant concentrations is anticipated to be minimal as a result of the dredge, 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.

9.7.54 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Disposal

Elevated suspended sediment concentrations

9.7.55 The changes in SSC that are predicted to occur as a result of the capital dredge disposal are presented at this preliminary stage in **Chapter 16: Physical Processes**. 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.

9.7.56 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 on mudflats and the shallow mud in the region are considered tolerant to this highly turbid environment (Ref 9-75; Ref 9-76; Ref 9-77). The predicted SSCs are within the range that can frequently occur naturally and also as a result of ongoing dredge and disposal activity (**Chapter 16: Physical Processes**).

9.7.57 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. Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Release of contaminants

9.7.58 The site-specific sediment sampling and analysis that will be undertaken to inform the Water and Sediment Quality assessment (**Chapter 17: Marine Water and Sediment Quality**) has not been undertaken at this preliminary stage.

9.7.59 However, based on existing evidence on the level of contamination in sediments within the vicinity of the Project, it is anticipated that the sediment will be suitable for disposal in the marine environment.

9.7.60 During disposal, sediment will be rapidly dispersed in the water column and redistributed. Furthermore, the disposal sites routinely receive dredging material from ports within the Humber Estuary and disposal is not expected to elevate contaminant concentrations above background levels.

9.7.61 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Underwater noise and vibration during piling, capital dredging and dredge disposal

9.7.62 Marine invertebrates lack a gas-filled bladder and are thus unable to detect the pressure changes associated with sound waves (Ref 9-82). However, all cephalopods as well as some bivalves, echinoderms, and crustaceans have a sac-like structure called a statocyst which includes a mineralised mass (statolith) and associated sensory hairs. Statocysts develop during the larval stage and may allow an organism to detect the particle motion associated with soundwaves in water to orient itself. In addition to statocysts, cephalopods have epidermal hair cells which help them to detect particle motion in their immediate vicinity, comparable to lateral lines in fish. Similarly, decapods have sensory setae on their body, including on their antennae which may be used to detect low-frequency vibrations. Whole body vibrations due to particle motion have been detected in cuttlefish and scallops, although species names and details of associated behavioural responses are not specified.

9.7.63 Scientific understanding of the potential effects of underwater noise on marine invertebrates is relatively underdeveloped (Ref 9-104). There is limited research to suggest that exposure to near-field low-frequency sound may cause anatomical damage (Ref 9-82). Anecdotal evidence indicates there was pronounced statocyst and organ damage in seven stranded giant squid after nearby seismic surveys (Ref 9-131). Airgun exposure can cause damaged statocysts in rock lobsters up to a year later (Ref 9-83). However, no such effects were detected in other studies (Ref 9-84). The disparate results between studies seem to be due to differences in sound exposure levels and duration, in some cases due to tank interference, although taxa-specific differences in physical vulnerability to acoustic stress cannot be discounted (Ref 9-82).

9.7.64 There is also increasing evidence to suggest that benthic invertebrates behaviourally respond to particle motion (vibration) (Ref 9-85). For example, blue mussels *Mytilus edulis* vary valve gape, oxygen demand and clearance rates (Ref 9-86) and hermit crabs *Paganus bernhardus* shift their shell and at very high amplitudes, leave their shell, examine it and then return (Ref 9-85). The vibration levels at which these responses were observed generally correspond to levels measured near anthropogenic operations such as pile driving and up to 300 m from explosives testing (blasting). A range of behavioural effects have also been recorded in decapod crustaceans, including a change in locomotion activity, reduction in antipredator behaviour and change in foraging habits (Ref 9-87). However, population level and mortality effects are considered unlikely.

Piling

9.7.65 Based on the evidence provided in the above scientific context review of the potential effects of underwater noise, population level and mortality effects in benthic invertebrates are considered unlikely. The Project will involve the installation of approximately 380 steel tubular piles, which are estimated to be a maximum of 1,372 mm diameter in size.

9.7.66 The duration of piling works will be defined at the next stage of the Project. Piling will not take place continuously as there will be periods of downtime, pile positioning and set up.

9.7.67 The construction of the Project may be completed in a single stage, or it may be sequenced such that the construction of the second berth takes place at the same time as operation of the first berth (refer to **Chapter 2: The Project**). In the case of a sequenced construction, the overall duration of piling will take place over a longer period. However, there will be no change in the overall peak levels of underwater noise generated by the construction of both berths at once versus a sequenced construction (i.e. the magnitude of change). Therefore, the underwater noise assessment is considered the worst case and will not be altered by a sequenced construction period.

9.7.68 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Capital dredge and disposal

9.7.69 Based on the above review of the potential effects of underwater noise, population level and mortality effects in benthic invertebrates are considered unlikely. Furthermore, dredging is known to produce lower noise levels than piling or blasting, and, therefore, there is unlikely to be significant effects on benthic invertebrates.

9.7.70 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

The potential introduction and spread of non-native species

9.7.71 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 (Ref 9-88). 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 (Ref 9-89).

9.7.72 The introduction and spread of non-native species can occur either accidentally or by intentional movement of species as a consequence of human activity (Ref 9-90 cited in Ref 9-91). 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 (Ref 9-92; Ref 9-85), 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 (Ref 9-85).

9.7.73 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.

9.7.74 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.

9.7.75 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 (Ref 9-93). Additionally, Section 14(1) of the 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.

9.7.76 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.

9.7.77 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 (Ref 9-94). 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 outline

CEMP. On this basis, the potential impact at this preliminary stage has been assessed as **not significant.**

Fish

9.7.78 This section contains a preliminary assessment of the potential impacts to fish receptors as a result of the construction phase of the Project. An assessment of the following impact pathways has been undertaken:

a. Direct loss or changes to fish populations and habitat as a direct result of dredging and dredge disposal;

b. Changes in water and sediment quality as a result of dredging and dredge disposal; and

c. Underwater noise and vibration during piling, capital dredging and dredge disposal.

Direct loss or changes to fish populations and habitat as a direct result of dredging and dredge disposal

Capital dredge

9.7.79 Habitat change could potentially impact on critical habitats including spawning, nursery and feeding grounds that have an important ecological function for fish. However, the dredge footprint is considered unlikely to provide important nursery or spawning functions for fish species as a result of the existing disturbed nature of this habitat despite known nursery or spawning areas for species such as Dover sole, whiting or cod occurring in the wider Humber Estuary area.

9.7.80 Potential prey items for flatfish and demersal fish such as polychaete worms were recorded during the project specific intertidal and subtidal surveys (**Appendix 9.A** (PEI Report, Volume IV)) (Ref 9-78). However, most fish species are opportunistic and generalist feeders, which means that they are generally not reliant on a single prey item. Fish are also mobile species and will easily be able to move away from the zone of influence and utilise other nearby areas for foraging. Furthermore, the area of habitat loss and change will only represent a small proportion of the foraging ranges of many fish species (particularly the larger and more commercial species such as whiting, plaice and Dover sole).

9.7.81 During dredging, there is the potential for fish along with roe (eggs) of these species to be removed. The region is known to support Dover sole spawning grounds. Dover sole spawn on a range of substrates in shallow water. However, the dredge footprint and nearby area is already subject to regular natural seabed disturbance due to strong tidal currents and also seabed disturbance as a result of existing vessel movements and ongoing maintenance dredging. The dredge footprint and nearby area is, therefore, likely to provide disturbed and sub-optimal spawning conditions with more optimal habitat present in the wider region. In addition, the dredge footprint is considered negligible in the context of suitable nursery habitat in the region.

9.7.82 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Disposal

9.7.83 The disposal of dredged material at the marine disposal sites will result in the deposition of sediments which has the potential to cause physical disturbance and smothering of seabed habitats.

9.7.84 The disposal grounds are located in a highly dynamic area with the mobile sandbanks subject to regular natural physical disturbance (and associated scouring) as a result of very strong tidal flows and deposition due to rdredge activity. This is reflected in a highly impoverished assemblage at both disposal sites (characterised by a few opportunistic species in very low numbers). This area is, therefore, likely to provide limited prey resources for fish species. In addition, as described above, benthic infaunal species characterising the disposal site are considered likely to show some tolerance to sediment deposition and also rapid recoverability rates. On this basis, potential effects on prey resources for fish are expected to be of low magnitude and temporary. Fish are also mobile species and will easily be able to move away from the zone of influence and return following the cessation of disposal activity.

9.7.85 The highly disturbed nature of the seabed is also unlikely to provide suitable conditions as a spawning or nursery area for fish.

9.7.86 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Changes in water and sediment quality as a result of dredging and dredge disposal

Capital dredge

9.7.87 The changes in SSC that could potentially occur as a result of the capital dredge are presented at this preliminary stage in the Physical Processes assessment (**Chapter 16: Physical Processes**) and summarised above in the 'Benthic habitats and species' sub-section (**Paragraphs 9.7.48** to **9.7.49**).

9.7.88 As noted in the preceding section, fish within the Humber Estuary are well adapted to living in an area with variable and typically very high suspended sediment loads. Fish feed on a range of food items and, therefore, their sensitivity to a temporary change in the availability of a particular food resource is considered to be low. Their high mobility enables them to move freely to avoid areas of adverse conditions and to use other food sources in the local area.

9.7.89 As highlighted above, salmonids and other migratory fish can be sensitive to elevated SSC However, Atlantic salmon and sea trout are both 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) (Ref 9-95; Ref 9-96; Ref 9-97; Ref 9-80; Ref 9-81). Other migratory species such as lamprey and shad species also pass through estuaries with high suspended sediments. Elevated SSCs due to dredging are expected to be of a magnitude that can occur naturally or as a result of ongoing maintenance dredging/disposal.

9.7.90 Sediment plumes resulting from dredging are also anticipated to be relatively localised (in the context of the entire width of the estuary) and dissipate relatively rapidly and be immeasurable against background levels within a relatively short duration of time. Therefore, salmonids and other migratory fish 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.

9.7.91 Given that elevated SSCs due to dredge and dredge disposal 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.

9.7.92 With respect to dissolved oxygen, increases in SSC are expected to be brief and localised.

9.7.93 With respect to sediment contamination, the site-specific sediment sampling and analysis that will be undertaken to inform the Water and Sediment Quality assessment (**Chapter 17: Marine Water and Sediment Quality**) has not been undertaken at this preliminary stage.

9.7.94 However, based on existing evidence on the level of contamination in sediments within the vicinity of the Project, the overall level of contamination in the proposed dredge area is likely to be low.

9.7.95 On this basis, the uplift in dissolved contaminant concentrations is anticipated to be minimal as a result of the dredge, 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.

9.7.96 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Dredge disposal

9.7.97 The changes in SSC that could potentially occur as a result of the disposal activities are presented at this preliminary stage in the Physical Processes assessment (**Chapter 16: Physical Processes**) and summarised above in the 'Benthic Habitats and Species' impact assessment sub-section (**Paragraphs 9.7.48** to **9.7.49**).

9.7.98 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 rapidly dissipate to background concentrations within a matter of hours and before the next disposal. As highlighted above, migratory species including Atlantic salmon 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) (Ref 9-80) 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.

9.7.99 With respect to sediment contamination, the site-specific sediment sampling and analysis that will be undertaken to inform the Water and Sediment Quality assessment (**Chapter 17: Marine Water and Sediment Quality**) has not been undertaken at this preliminary stage.

9.7.100 However, based on existing evidence on the level of contamination in sediments within the vicinity of the Project, it is anticipated that the sediment will be suitable for disposal in the marine environment.

9.7.101 During disposal, sediment will be rapidly dispersed in the water column and redistributed. Furthermore, the disposal sites routinely receive maintenance dredging material from ports within the Humber Estuary and disposal is not expected to elevate contaminant concentrations above background levels.

9.7.102 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Underwater noise and vibration during piling, capital dredging and dredge disposal

9.7.103 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 Project (**Appendix 9.B** (PEI Report, Volume IV)) and is briefly summarised in this section.

9.7.104 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.

9.7.105 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 (Ref 9-98; Ref 9-99; Ref 9-100). For most dredging activities, the main source of sound relates to the vessel engine noise.

9.7.106 There is a wide diversity in hearing structures in fish which leads to different auditory capabilities across species (Ref 9-101). All fish can sense the particle motion[12] component of an acoustic field via the inner ear as a result of whole-body accelerations (Ref 9-102), 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 (Ref

[12] 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.

9-103; Ref 9-104; Ref 9-105). Although many fish are also likely to detect sound pressure[13], particle motion is considered equally or potentially more important (Ref 9-106).

9.7.107 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 (Ref 9-106). Ref 9-103 proposed the following three categories of fish which are described below:

a. Fish with a swim bladder or air cavities that aid hearing;

b. Fish with a swim bladder that does not aid hearing; and

c. Fish with no swim bladder.

9.7.108 The first category comprises fish that have special structures mechanically linking the swim bladder to the ear. Fish species in the study area that fall within this first category include herring (*Clupea harengus*) and shads.

9.7.109 The second category comprises fish with a swim bladder where the organ does not appear to play a role in hearing. Fish species in the study area that fall within this second category include Atlantic cod (*Gadus morhua*), Atlantic salmon (*Salmo salar*), European eel (*Anguilla anguilla*), European seabass (*Dicentrarchus labrax*), Atlantic mackerel (*Scomber scombrus*), smelt (*Osmerus eperlanus*) and whiting (*Merlangius merlangus*).

9.7.110 The third category comprises fish lacking swim bladders that are sensitive only to sound particle motion and show sensitivity to only a narrow band of frequencies (e.g. flatfishes, sharks, skates and rays). Fish species in the study area that fall within this third category include plaice (*Pleuronectes platessa*), sea lamprey (*Petronmyzon marinus*), sole (*Solea solea*) and thornback ray (*Raja lavate*).

Piling

9.7.111 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.B** (PEI Report, Volume IV).

9.7.112 The predicted range at which the quantitative instantaneous peak Sound Pressure Level (SPL) thresholds for pile driving are reached (as defined in Ref 9-103) indicates that there is a risk of mortality, potential mortal injury or recoverable injury within 22 m from the source of impact piling in fish with a swim bladder (such as herring, Atlantic salmon and European eel) and within 10 m in fish with no swim bladder (such as lamprey and flatfish). For vibro-piling, there is a risk of mortality, potential mortal injury or recoverable injury within 3 m from the source in fish with a swim bladder and within 1 m in fish with no swim bladder.

9.7.113 The calculator developed by the United States National Marine Fisheries Service (NMFS) (Ref 9-107) as a tool for assessing the potential effects to fish exposed

[13] 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 elevated levels of underwater sound produced during pile driving was used to calculate the range at which the cumulative Sound Exposure Levels (SEL) thresholds for pile driving (Ref 9-103) are reached. Based on the assumptions highlighted in **Appendix 9.B** (PEI Report, Volume IV), there is predicted to be a risk of mortality and potential mortal injury within 72 m from the source of impact piling in fish with a swim bladder involved in hearing (such as herring), within 49 m from the source in fish with a swim bladder not involved in hearing (such as European eel) and within 15 m in fish with no swim bladder (such as sole). The distance at which the received level of noise is within the limits of the recoverable injury threshold is within 121 m in fish with a swim bladder and 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 38 m from the source in fish with a swim bladder involved in hearing, within 26 m from the source in fish with a swim bladder not involved in hearing and 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 64 m in fish with a swim bladder and 12 m in fish without a swim bladder.

9.7.114 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 Project is not considered a key foraging, spawning or nursery habitat for fish and, therefore, this localised zone of injury is unlikely to result in any significant effects on fish.

9.7.115 The range at which the Ref 9-108 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.

9.7.116 The scale of the behavioural response is partly dependent on the hearing sensitivity of the species. The key fish in the study area include species across the range of Ref 9-103 fish hearing groups. Fish with a swim bladder involved in hearing (e.g. herring) may exhibit a moderate behavioural reaction within a distance in which a behavioural response is predicted (e.g. a sudden change in swimming direction, speed or depth). Fish with a swim bladder that is not involved in hearing (e.g. European eel) are likely to display a milder behavioural reaction. Fish without a swim bladder (e.g. river lamprey) are likely to show only very subtle changes in behaviour in this zone.

9.7.117 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.

9.7.118 The effects of piling noise on fish also need to be considered in terms of the duration of exposure. Information on duration of piling activities will be available at the next stage of the Project and will inform the environmental assessments that support the DCO application. Although the total duration of piling activities is still to be defined it is recognised that piling will not take place continuously as there will be periods of downtime, pile positioning and set up.

9.7.119 The piling works will be undertaken 7 am to 7 pm (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 in a 12-hour shift. There will, therefore, 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 1 % (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 13 % of the time.

9.7.120 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.

9.7.121 Based on the available information provided above, whilst only temporary and short term in duration, the effect to Atlantic salmon, sea trout, European smelt, shads, European eel is considered to be potentially **significant**. In terms of other fish occurring in the Humber Estuary, the potential impact at this preliminary stage has been assessed as **not significant.**

Capital dredge and dredge disposal

9.7.122 The relative risk and distances at which potential mortality/injury and behavioural effects in fish are predicted to occur as a result of the dredging and vessel movements associated with the construction and operation of the Project are included in **Appendix 9.B** (PEI Report, Volume IV).

9.7.123 The worst case source level (SL) generated by dredging and vessels is below the Ref 9-103 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 Ref 9-103 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.

9.7.124 According to Ref 9-103, the risk of recoverable injury is also considered low for fish with no swim bladder and fish with a swim bladder that is not involved in hearing. There is a greater risk of recoverable injury in fish where the swim

bladder is involved in hearing (e.g. herring) whereby a cumulative noise exposure threshold is recommended (170 dB rms for 48 h). The distance at which recoverable injury is predicted in these fish as a result of the dredging and vessel movements is 10 m.

9.7.125 Ref 9-103 advises 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 and fish with a swim bladder that is not involved in hearing 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) whereby 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.

9.7.126 Ref 9-103 guidelines suggest that there is considered to be a high risk of potential behavioural responses occurring in the nearfield (i.e. tens of metres from the source) for fish species with a swim bladder involved in hearing and a moderate risk in other fish species. 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.

9.7.127 Overall, there is considered to be a low risk of any injury in fish as a result of the underwater noise generated by dredging and vessel movements although recoverable injury could potentially occur in very close proximity to the dredger in fish where the swim bladder is involved in hearing (e.g. herring). 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 fish as a result of the dredging and vessel movements. Behavioural responses are anticipated to be spatially negligible in scale and fish will be able to move away and avoid the source of the noise as required. Furthermore, the period of dredging will be relatively short term.

9.7.128 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Marine Mammals

9.7.129 This section contains a preliminary assessment of the potential impacts to marine mammal receptors as a result of the construction phase of the Project. The following impact pathway has been assessed:

a. Underwater noise and vibration during piling, capital dredging and dredge disposal.

Underwater noise and vibration during piling, capital dredging and dredge disposal

9.7.130 Elevated underwater noise and vibration levels during construction activities has the potential to cause physiological damage and induce adverse behavioural

reactions. A detailed Underwater Noise assessment has been undertaken for the Project (**Appendix 9.B** (PEI Report, Volume IV)) and is briefly summarised in this section.

9.7.131 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.

9.7.132 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 (Ref 9-98; Ref 9-99; Ref 9-100). For most dredging activities, the main source of sound relates to the vessel engine noise.

9.7.133 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.

9.7.134 The National Oceanic and Atmospheric Administration (Ref 9-111) 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 Ref 9-109 for preventing auditory/physiological injuries in marine mammals. Further recommendations have recently been published regarding marine mammal noise exposure by Ref 9-110 which complement the Ref 9-111 thresholds and also look at a wider range of marine mammal species.

9.7.135 The Ref 9-111 and Ref 9-110 thresholds are categorised according to marine mammal hearing groups. The key marine mammal species found in the study area for the scheme comprise harbour porpoise, common seal and grey seal. According to Ref 9-111, harbour porpoise is categorised as a high-frequency (HF) cetacean and common and grey seals are categorised as phocid pinniped (PW) (earless seals or “true seals”).

9.7.136 There are no equivalent SPL behavioural response criteria that would represent the sources of underwater noise associated with the Project. 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 (Ref 9-109).

9.7.137 Field studies have demonstrated behavioural responses of harbour porpoises to anthropogenic noise (Ref 9-112). A number of studies have shown avoidance of pile driving activities during offshore wind farm construction (Ref 9-113; Ref 9-114; Ref 9-115), with the range of measurable responses extending to at least 21 km in some cases (Ref 9-116). Seismic surveys have also elicited avoidance

behaviour in harbour porpoises, albeit short-term (Ref 9-117), and monitoring of echolocation activity suggests possible negative effects on foraging activity in the vicinity of seismic operations (Ref 9-118). There is a scarcity of studies quantifying behavioural impacts from dredging (Ref 9-119). One investigation showed that harbour porpoises temporarily avoided an area of sand extraction off the Island of Sylt in Germany (Ref 9-120). This study found that, when the dredging vessel was closer than 600 m to the porpoise detector location, it took three times longer before a porpoise was again recorded than during times without sand extraction. However, after the ship left the area, the clicks made by harbour porpoise (for echolocation) resumed to the baseline rate (Ref 9-120).

9.7.138 Few studies have documented responses of seals to underwater noise in the field (Ref 9-112). Tracking studies found reactions of the grey seals to pile driving during the construction of windfarms were diverse (Ref 9-121). 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.

9.7.139 A telemetry study found no overall significant displacement of common seal during construction of a wind farm in The Wash, south-east England (Ref 9-35). 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.

9.7.140 A playback experiment was conducted 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) (Ref 9-122). 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: Animals have been reported swimming away and avoidance within ~150 m of a seismic survey(Ref 9-130), while other studies have found no discernible difference in seal densities in response to construction and drilling for an oil pipeline (Ref 9-123).

9.7.141 A number of field observations of harbour porpoise and pinnipeds to multiple pulse sounds have been made and are reviewed by Ref 9-109). The results of these studies are considered too variable and context-specific to allow single disturbance criteria for broad categories of taxa and of sounds to be developed. 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 dBht metric and its limitations is provided in **Appendix 9.B** (PEI Report, Volume IV).

Piling

9.7.142 The distances at which permanent threshold shifts (PTS), TTS and behavioural effects in marine mammals that occur in the study area are predicted to occur during impact piling and vibro-piling for the Project are included in **Appendix 9.B** (PEI Report, Volume IV).

9.7.143 There is predicted to be a risk of instantaneous PTS and TTS in harbour porpoise within 42 m and 90 m respectively from the source of the percussive piling noise. The risk of instantaneous PTS and TTS in seals is within 5 m and 12 m respectively.

9.7.144 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 harbour porpoise is 1.8 km and 12.6 km respectively. The maximum distance for PTS and TTS in seals is 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 harbour porpoise is 94 m and 1.2 km respectively. The maximum distance for PTS and TTS in seals is 44 m and 581 m respectively.

9.7.145 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 harbour porpoise to leave the centre of the cumulative SEL weighted PTS and TTS injury zones during impact piling is estimated to be 20 minutes and 2.3 hours respectively. This is less than 10 % of the time that would be required for an injury to occur and, therefore, assuming harbour porpoise evade the injury effects zone, they are not considered to be at risk of any permanent or temporary injury during impact piling. The maximum time that would take seals to leave the PTS and TTS zones 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 evade the injury effects zone, they are not considered to be at risk of any permanent or temporary injury during impact piling.

9.7.146 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 harbour porpoise to leave the centre of the cumulative SEL weighted PTS and TTS injury zones during vibro piling is estimated to be 1 minute and 14 minutes respectively. This is less than 1 % of the time that would be required for an injury to occur and, therefore, assuming harbour porpoise evade the injury

effects zone, they are not considered to be at risk of any permanent or temporary injury during vibro piling. The maximum time that it would take seals to leave the PTS and TTS zones 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.

9.7.147 Impact piling is predicted 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.

9.7.148 The results indicate that if any marine mammals 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 marine mammal will stay within this “injury zone” during the piling operations.

9.7.149 Any marine mammals present are likely to evade the area. Behavioural responses could include movement away from a sound source, aggressive behaviour related to noise exposure (e.g. tail/flipper slapping, fluke display, abrupt directed movement), visible startle response and brief cessation of reproductive behaviour (Ref 9-109). Mild to moderate behavioural responses of any individuals within these zones could include movement away from a sound source and/or visible startle response (Ref 9-109).

9.7.150 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 considered the potential for the restriction of the movements of marine mammals upstream and downstream (i.e. a barrier to movements). The Humber Estuary upstream of the Project 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 and harbour porpoise are frequently recorded foraging in the Humber Estuary. Any barrier to movements caused by the noise during piling would be temporary with significant periods of a 24-hour period when no piling will be undertaken (see below) which will allow the unconstrained movements of marine mammals through the Humber Estuary. Marine mammals are also highly mobile and wide ranging and therefore are likely to be able to exploit other areas for foraging during any piling.

9.7.151 The effects of piling noise on marine mammals also need to be considered in terms of the duration of exposure. Piling noise will take place over a period of approximately 13 weeks. Piling will not take place continuously as there will be periods of downtime, pile positioning and set up.

9.7.152 The piling works will be undertaken 7 am to 7 pm (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 in a 12 hour shift. There will, therefore, be significant periods over a 24-hour period when marine mammals will not be disturbed by any piling noise. The actual proportion of impact piling is estimated to be at worst around 13 % (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 marine mammals that remain within the predicted behavioural effects zone at the time of percussive piling will be exposed a maximum of up to 13 % of the time.

9.7.153 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.

9.7.154 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as potentially **significant.**

Capital dredge and dredge disposal

9.7.155 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 Project are included in **Appendix 9.B** (PEI Report, Volume IV).

9.7.156 NOAA's user spreadsheet tool (Ref 9-111) has been used to predict the range at which the weighted cumulative SEL acoustic thresholds (Ref 9-111) for PTS and TTS are reached during the proposed dredging and disposal activity based on the assumptions highlighted in **Appendix 9.B** (PEI Report, Volume IV).

9.7.157 There is predicted to be no risk of PTS in harbour porpoise and the risk of TTS is limited to within less than 44 m from the dredging or vessel activity. There is predicted to be no risk of PTS in seals and the risk of TTS is limited to within 12 m from the source.

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

9.7.159 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant.**

Operation

9.7.160 This section contains a preliminary assessment of the potential impacts to marine ecology receptors as a result of the operational phase of the Project – those effects being reviewed in **Table 9.11**. This section includes an explanation of the rationale that was adopted for scoping in or out individual pathways for further assessment.

9.7.161 It is noted that maintenance dredging is an activity which is ongoing within the Port of Immingham. Maintenance dredging for the Project is expected to be required periodically and will be carried out in line with the existing regime. 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 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 Port of Immingham berths. Therefore, it is considered that the likely impacts on marine receptors as a result of maintenance dredging will be comparable to the existing maintenance dredge regime. The magnitude of potential impacts are also considered to be either equivalent to or lower than the capital dredge. On this basis, potential effects associated with all the maintenance dredging pathways are discussed in **Table 9.12** but have been scoped out of a more detailed assessment.

Table 9.12: Potential effects during operation scoped in / out of the further detailed assessment undertaken

Receptor	Impact Pathways/Potential Effects	Project activity	Included in more detailed assessment?	Justification
Benthic habitats and species	Direct changes to benthic habitats and species beneath marine infrastructure due to shading	Operation	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. This impact pathway has, therefore, been scoped into the assessment.
	Changes to benthic habitats and species as result of seabed removal during dredging	Maintenance dredging	No	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. As summarised in the preliminary physical processes assessment (**Chapter 16: Physical Processes**), maintenance dredging is expected to be required periodically with a lower level of maintenance to that which is presently afforded to the Immingham berths. Maintenance dredging will be carried out periodically throughout operation and will create similar seabed sedimentary conditions to that occurring following capital dredging. However, maintenance dredging will cause an ongoing source of seabed disturbance, albeit in localised areas. It should be noted that no dredging will be required around the jetty structures. Furthermore, the project-specific subtidal survey (**Section 9.3** of this chapter and **Appendix 9.A** (PEI Report, Volume IV)) 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 and sediment transport.

Receptor	Impact Pathways/Potential Effects	Project activity	Included in more detailed assessment?	Justification
				All the species recorded are considered commonly occurring and not protected with the faunal assemblage recorded considered characteristic of subtidal habitats found more widely in this section of the Humber Estuary (Ref 9-124; Ref 9-23; Ref 9-24; Ref 9-22). Subtidal habitats in the area around the Port of Immingham are also considered to be typically of limited ecological value. Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.
		Dredge disposal	N/A	This pathway relates to changes in habitat resulting directly from seabed removal and is, therefore, not considered relevant to the dredge disposal activity. Potential effects resulting from sediment deposition at the disposal site are discussed below.
	Changes to habitats and species as a result of sediment deposition	Maintenance dredging and disposal	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 reproductive rates which

Receptor	Impact Pathways/Potential Effects	Project activity	Included in more detailed assessment?	Justification
				allow populations to typically rapidly recolonise disturbed habitats, many within a few months following the disturbance events (Ref 9-78; Ref 9-75; Ref 9-76; Ref 9-77). 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 is reflected in a generally impoverished assemblage at both disposal sites. In addition, millions of wet tonnes of dredge sediment are disposed of at HU060 annually which will also cause some disturbance due to sediment deposition. 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 (Ref 9-78; Ref 9-75; Ref 9-76; Ref 9-77). On this basis, any effects are considered to be temporary and short term. Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.
	Indirect changes to seabed habitats and species as a result of changes to hydrodynamic and sedimentary processes	Maintenance dredging and disposal	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. 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, changes in hydrodynamic and sedimentary processes that are of a

Receptor	Impact Pathways/Potential Effects	Project activity	Included in more detailed assessment?	Justification
				negligible magnitude are expected. Such changes are unlikely to be discernible against natural processes at nearby intertidal habitats. Furthermore, such changes are not expected to modify existing subtidal habitat types found in the area. Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.
	Changes in water and sediment quality	Maintenance dredge and dredge disposal	No	Changes in water quality lower than for the capital dredge and similar to existing maintenance dredging. Elevated SSCs due to maintenance dredging and dredge disposal are anticipated to be of a magnitude that can occur naturally or as a result of existing maintenance dredging/disposal and sediment plumes resulting from dredging would also be expected to dissipate relatively rapidly and be immeasurable against background levels within a relatively short duration of time. 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 (Ref 9-78; Ref 9-75; Ref 9-76; Ref 9-77). The site-specific sediment sampling and analysis that will be undertaken to inform the Water and Sediment Quality assessment (**Chapter 17: Marine Water and Sediment Quality**) has not been undertaken at this preliminary stage. However, based on existing evidence on the level of contamination in sediments within the vicinity of the Project, there is no reason to believe the sediment will be unsuitable for disposal in the marine environment.

Receptor	Impact Pathways/Potential Effects	Project activity	Included in more detailed assessment?	Justification
				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. Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.
		Surface water drainage	No	Standard measures to control surface water run-off during operation are embedded within the Project design for legislative compliance, and therefore there would be no potential for pollution to the Humber Estuary. This impact pathway has, therefore, been scoped out of the assessment.
	Underwater noise	Vessel operations, maintenance dredge and dredge disposal	No	Population level and mortality effects in benthic invertebrates are considered unlikely for piling or blasting. Maintenance dredging is known to produce lower noise levels than piling or blasting, and, therefore, there is unlikely to be significant effects on benthic invertebrates and this impact pathway has been scoped out of the assessment.
	Non-native species transfer during vessel operations	Vessel operations	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. This impact pathway has, therefore, been scoped into the assessment.
	Damage to sensitive habitats as a result of changes in air quality.	Road traffic emissions	No	The predicted number of operational vehicle movements is lower than the IAQM and EPUK screening guidance (see **Chapter 6: Air Quality**), below which a road traffic impact is unlikely to contribute to a significant effect on local air quality. This impact pathway has, therefore, been scoped out of the assessment.

Receptor	Impact Pathways/Potential Effects	Project activity	Included in more detailed assessment?	Justification
		Marine vessel emissions and landside plant emissions	Yes	Emissions from docked marine vessels and landside plant during operation have been modelled in **Chapter 6: Air Quality**. The potential for NO_x, NH_3, SO_2 and N deposition to affect designated habitats within the Humber Estuary EMS has been identified, and this impact pathway has, therefore, been scoped into the assessment.
Fish	Changes to fish populations and habitat	Maintenance dredge and dredge disposal	No	As summarised above, impacts on benthic prey and fish receptors as a result of maintenance dredging are anticipated to be equivalent to or lower than the capital dredge and comparable to the existing maintenance dredge regime. The maintenance dredge footprint and proposed disposal site are considered unlikely to provide important nursery or spawning functions for fish species as a result of the disturbed nature of these habitats despite known nursery or spawning areas occurring in the wider Humber Estuary area[14]. Therefore, while during dredging, there is the potential for fish along with roe (eggs) of these species to be removed, sub-optimal spawning conditions are likely to be present with more optimal habitat occurring in the wider Humber Estuary area. In addition, the dredge footprint is considered negligible in the context of suitable spawning habitat in the region. As summarised above, the predicted impacts on benthic habitats and species (and therefore prey for fish receptors) as a result of maintenance dredging are considered to be equivalent or lower than the capital dredge and comparable to the existing maintenance dredge

[14] The maintenance dredge footprint and nearby area is already subject to regular natural seabed disturbance as a result of existing vessel movements and ongoing maintenance dredging. The disposal ground is located in a highly dynamic area with the mobile sandbanks subject to regular natural physical disturbance (and associated scouring) as a result of very strong tidal flows and deposition due to regular maintenance dredge activity.

Receptor	Impact Pathways/Potential Effects	Project activity	Included in more detailed assessment?	Justification
				regime. Most fish species are opportunistic and generalist feeders, which means that they are generally not reliant on a single prey item. Fish are also mobile species and will easily be able to move away from the zone of influence and utilise other nearby areas for foraging. Furthermore, the area of habitat change will only represent a small proportion of the foraging ranges of many fish species (particularly the larger and more commercial species such as whiting, plaice and Dover sole). Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.
	Changes in water and sediment quality	Maintenance dredge and dredge disposal	No	Changes in water quality are also expected to be lower than for the capital dredge and similar to existing maintenance dredging. Fish within the Humber Estuary are well adapted to living in an area with variable and typically high suspended sediment loads. Fish feed on a range of food items and, therefore, their sensitivity to a temporary change in the availability of a particular food resource is considered to be low. Their high mobility enables them to move freely to avoid areas of adverse conditions and to use other food sources in the local area. With specific respect to migratory fish, salmonids and other migratory fish can be sensitive to elevated suspended sediment concentrations. However, these species are known to migrate through estuaries with high suspended sediment concentrations (including the Humber Estuary). Elevated SSCs due to dredging are anticipated 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 expected to dissipate relatively rapidly and be immeasurable against

Receptor	Impact Pathways/Potential Effects	Project activity	Included in more detailed assessment?	Justification
				background levels within a relatively short duration of time. Therefore, salmonids and other migratory fish 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. Given that elevated SSCs due to dredge and dredge disposal 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 existing 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 effected by the dredging. The site-specific sediment sampling and analysis that will be undertaken to inform the Water and Sediment Quality assessment (**Chapter 17: Marine Water and Sediment Quality**) has not been undertaken at this preliminary stage. However, based on existing evidence on the level of contamination in sediments within the vicinity of the Project, there is no reason to believe the sediment will be unsuitable for disposal in the marine environment. Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.
	Underwater noise	Maintenance dredge and dredge disposal	No	The outcomes of the assessment of underwater noise disturbance from capital dredging activities during construction will be the same for maintenance dredging activities during operation. A worst-case source level for all types of dredgers has been applied to the underwater noise assessment and, therefore, the predicted ranges of effect are

Receptor	Impact Pathways/Potential Effects	Project activity	Included in more detailed assessment?	Justification
				applicable to both the maintenance and capital dredging activities. Underwater noise effects on fish were assessed as not significant during capital dredging. The magnitude of potential impact is considered equivalent during maintenance dredging. The potential effect is, therefore, considered to be **not significant** and has been scoped out of more detailed assessment.
	Underwater noise	Vessel operations	No	During the operational phase there is the potential for noise disturbance to fish species as a result of vessel movements. The worst-case source level associated with vessels during operation is the same as for dredging activity and, therefore, the predicted ranges of effect applicable to vessel and dredging operations are the same. Overall, only mild behavioural responses in close proximity to the vessels are anticipated with noise levels unlikely to be discernible above ambient levels in the wider Humber Estuary area. The potential effect has been scoped out of more detailed assessment.
	Lighting	Vessel operations	No	The jetty/pier decking will be lit for safety and operational purposes. For any shoaling fish near the surface, the Project will potentially only cause minor changes in behaviour such as increased shoaling in the vicinity of the light source. Such responses could increase the risk of predation but could also have positive effects such as enhancing feeding efficiency. The low levels of lighting would not cause disruption or blocking of migratory routes. The potential effect has been scoped out of more detailed assessment.

Receptor	Impact Pathways/Potential Effects	Project activity	Included in more detailed assessment?	Justification
Marine mammals	Underwater noise	Maintenance dredge and dredge disposal	No	The outcomes of the assessment of underwater noise disturbance from capital dredging activities during construction will be the same for maintenance dredging activities during operation. A worst-case source level for all types of dredgers has been applied to the underwater noise assessment and, therefore, the predicted ranges of effect are applicable to both the maintenance and capital dredging activities. Underwater noise effects on marine mammals were assessed as not significant during capital dredging with only short-term and mild behavioural response predicted. The magnitude of potential impact is considered equivalent during maintenance dredging. The potential effect has been scoped out of more detailed assessment.
	Underwater noise	Vessel operations	No	During the operational phase there is the potential for noise disturbance to marine mammal species as a result of vessel movements. The worst-case source level associated with vessels during operation is the same as for dredging activity and, therefore, the predicted ranges of effect applicable to vessel and dredging operations are the same. Overall, only mild behavioural responses in close proximity to the vessels are anticipated with noise levels unlikely to be discernible above ambient levels in the wider Humber Estuary area. The potential effect has been scoped out of more detailed assessment.
	Visual disturbance of hauled out seals	Vessel operations, maintenance dredge and dredge disposal	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 benthic surveys as detailed in Ref 9-48. This haul out site is located approximately 4 km north east from the Project. No seal haul out sites are known to occur nearer to the Project.

Receptor	Impact Pathways/Potential Effects	Project activity	Included in more detailed assessment?	Justification
				Seals which are hauled out on land, either resting or breeding, are considered particularly sensitive to visual disturbance (Ref 9-68). 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 (Ref 9-69; Ref 9-70; Ref 9-71; Ref 9-72). 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 (Ref 9-73). 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 (Ref 9-74). Based on this evidence, seals hauled out on the intertidal habitats of Sunk Island (located on the opposite bank to the Project) are out of the zone of influence of any potential visual disturbance effects as a result of maintenance dredging and vessel operations. The potential for disturbance to hauled out seals has, therefore, been scoped out of the assessment.
	Collision risk	Vessel operations	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 (Ref 9-51). Furthermore, the region is already characterised by heavy

Receptor	Impact Pathways/Potential Effects	Project activity	Included in more detailed assessment?	Justification
				shipping traffic. The additional operational vessel movements resulting from the Project will only constitute a small increase in vessel traffic in the area on a typical day. There will also be periodic maintenance dredger and barge movements. In general, incidents of mortality or injury of marine mammals caused by vessels remain a relatively rare occurrence in UK waters (Ref 9-52; Ref 9-53). 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 (Ref 9-53). 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 has, therefore, been scoped out of the assessment.

Benthic Habitats and Species

9.7.162 This section contains an assessment of the potential impacts to benthic ecology receptors as a result of the operational phase of the Project. The following impact pathways have been assessed:

a. Direct changes to benthic habitats and species beneath marine infrastructure due to shading;

b. Non-native species transfer during vessel operations; and

c. Changes in air quality due to marine vessel and landside plant emissions.

Direct changes to benthic habitats and species beneath marine infrastructure due to shading

9.7.163 Artificial shading such as due to jetty/pier decking has the potential to cause localised changes to the structure and functioning of biological communities in natural ecosystems (Ref 9-125; Ref 9-126; Ref 9-127).

9.7.164 Changes in sunlight levels as a result of shading have the potential to cause changes to the benthic community occurring in an area. 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.

9.7.165 The open piled approach jetty 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.

9.7.166 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Non-native species transfer during vessel operations

9.7.167 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.

9.7.168 Based on the available information provided above (**Paragraphs 9.7.71** to **9.7.77**), the potential impact at this preliminary stage has been assessed as **not significant**.

Changes in air quality due to marine vessel and landside plant emissions

9.7.169 Emissions from docked marine vessels and landside plant during operation have been modelled in **Chapter 6: Air Quality**. The potential for NOx, NH_3, SO_2 and

N deposition to affect designated habitats within the Humber Estuary EMS has been identified.

9.7.170 At the worst affected nature conservation receptor (E11, which relates to saltmarsh habitat on the northern shore of the Estuary), the change in annual mean NH_3 and SO_2 can be screened as insignificant in line with Environment Agency guidance. However, the annual mean NOx concentration and annual N deposition rate cannot be screened as insignificant.

9.7.171 For saltmarsh, the APIS provides a Critical Load range of 20 to 30 kg/ha/yr and nitrogen inputs have been experimentally demonstrated to have an effect on overall species composition of saltmarsh. However, the Critical Loads on APIS are relatively generic for each habitat type and cover a wide range of deposition rates. They do not (and are not intended to) take other influences (to which the habitat on a given site may be exposed) into consideration.

9.7.172 Moreover, it is important to note from APIS that the experimental studies which underlie conclusions regarding the sensitivity of saltmarsh have *'… neither used very realistic N doses nor input methods i.e. they have relied on a single large application more representative of agricultural discharge'*, which is far in excess of anything that would be deposited from atmosphere. Therefore, APIS indicates that determining which part of the critical load range to use for saltmarsh requires expert judgment. Overall, there is good reason to believe the upper part of the critical load range (30 kg N/ha/yr) may be more appropriate than the lower part (20 kg N/ha/yr) for upper saltmarsh.

9.7.173 Generally, nitrogen inputs from the air are not as important as nitrogen from other sources. Effects of nitrogen deposition from atmosphere are likely to be dominated by much greater impacts from marine or agricultural sources. This is reflected on APIS itself, which states regarding saltmarsh that '*Overall, N deposition [from atmosphere] is likely to be of low importance for these systems as the inputs are probably significantly below the large nutrient loadings from river and tidal inputs*'. Another mitigating factor is that the nature of intertidal saltmarsh in the Humber estuary means that there is daily flushing from tidal incursion. This is likely to further reduce the role of nitrogen from atmosphere in controlling botanical composition.

9.7.174 Therefore the additional predicted contribution from nitrogen emissions from the Project does not result in any exceedance of the Critical Load range for saltmarsh, and it is concluded that there will be a neutral effect (not significant) on the Humber Estuary designated site, which is **not significant**.

Decommissioning

9.7.175 The DCO for the Project would not make any provision for the decommissioning of the marine infrastructure above and below water level. This is because the development would, once constructed, become part of the fabric of the Immingham port estate and would, in simple terms, continue to be maintained so that it can be used for port related activities to meet a long-term need. Decommissioning impacts have therefore been scoped out of the assessment.

9.8 Mitigation and Enhancement Measures

Underwater noise and vibration on fish and marine mammals as a result of construction

9.8.1 In order to reduce the level of potential impact associated with underwater noise and vibration on fish and marine mammals during construction (piling), a number of mitigation measures are being considered including the use of soft start procedures, the use of vibro piling where possible with seasonal/night time piling restrictions specifically for migratory fish species and JNCC piling protocols for marine mammals (Ref 9-18).

9.8.2 These mitigation measures would be further developed, if required, through ongoing engagement with statutory authorities as part of the statutory consultation process and taking into account the final scheme design information and latest understanding of potential effects.

9.9 Preliminary Assessment of Residual Effects

Construction

9.9.1 The following sections summarise the likely effects on marine ecology receptors. Potential effects on the following receptors during construction were assessed as potentially significant:

a. Underwater noise and vibration on fish as a result of piling; and

b. Underwater noise and vibration on marine mammals as a result of piling.

9.9.2 With the implementation of appropriate mitigation measures, the residual effects on these receptors are considered likely to be not significant at this preliminary stage.

9.9.3 All the other potential impacts on nature conservation and marine ecology receptors have, at this preliminary stage, and based on the current project design, been assessed as **not significant**.

Operation

9.9.4 All potential impacts on nature conservation and marine ecology receptors during operation have, at this preliminary stage, and based on the current project design, been assessed as **not significant**.

Decommissioning

9.9.5 The DCO for the Project would not make any provision for the decommissioning of the marine infrastructure above and below water level. This is because the development would, once constructed, become part of the fabric of the Immingham port estate and would, in simple terms, continue to be maintained so that it can be used for port related activities to meet a long-term need. On this basis, potential effects on marine ecology receptors from decommissioning have been scoped out.

9.9.6 The final outcomes of the likely significant effects of the Project on marine ecology will be reported within the ES.

9.10 Summary of Preliminary Assessment

9.10.1 A summary of the impact pathways that have been assessed at this preliminary stage, together with the identified residual impacts and level of confidence is presented in **Table 9.20**.

Table 9.13: Summary of potential impact, mitigation measures and residual effects

Receptor	Impact pathway	Impact Significance	Mitigation Measure	Residual Effect	Confidence
Construction Phase					
Benthic habitats and species	Direct loss of intertidal habitat as a result of the piles	Not significant	N/A	Not significant	**Medium**
	Direct loss of subtidal habitat as a result of the piles	Not significant	N/A	Not significant	**High**
	Changes to benthic habitats and species as result of the removal of seabed material during dredging	Not significant	N/A	Not significant	**High**
	Changes to habitats and species as a result of sediment deposition during dredging and dredge disposal	Not significant	Target disposal loads in the central/ deeper area of the disposal sites to reduce depth reductions	Not significant	**Medium**
	Indirect loss or change to seabed habitats and species as a result of changes to hydrodynamic and sedimentary processes during capital dredging and dredge disposal	Not significant	N/A	Not significant	**Medium**
	Changes in water and sediment quality during capital dredging and dredge disposal	Not significant	N/A	Not significant	**Medium**

Receptor	Impact pathway	Impact Significance	Mitigation Measure	Residual Effect	Confidence
	Underwater noise and vibration during piling, capital dredging and dredge disposal	Not significant	N/A	Not significant	**Medium**
	Introduction and spread of non-native species	Not significant	Include biosecurity control measures within the CEMP	Not significant	**Medium**
Fish	Direct loss or changes to fish populations and habitat as a direct result of dredging and dredge disposal	Not significant	N/A	Not significant	**Medium**
	Changes in water and sediment quality as a result of dredging and dredge disposal	Not significant	N/A	Not significant	**Medium**
	Underwater noise disturbance and vibration during piling, capital dredging and dredge disposal	Potentially significant (migratory fish during piling) Not significant (other fish species during piling) Not significant (dredge and dredge disposal)	In order to reduce the level of potential impact associated with underwater noise and vibration on fish during piling, a number of mitigation measures are being considered including the use of soft start procedures, the use of vibro piling where possible and seasonal/night time piling restrictions specifically for migratory fish.	Not significant	**Medium**
Marine mammals	Underwater noise disturbance and vibration during piling, capital dredging and dredge disposal	Potentially significant (piling) Not significant (dredge and dredge disposal)	In order to reduce the level of potential impact associated with underwater noise and vibration on fish during piling, a number of mitigation measures are being considered including the use of soft start	Not significant	**Medium**

Receptor	Impact pathway	Impact Significance	Mitigation Measure	Residual Effect	Confidence
			procedures, the use of vibro piling where possible and JNCC piling protocols f (Ref 9-18).		
Operational Phase					
Benthic habitats and species	Direct changes to benthic habitats and species beneath marine infrastructure due to shading	Not significant	N/A	Not significant	**Medium**
	Non-native species transfer during vessel operations	Not significant	N/A	Not significant	**Medium**
	Damage to sensitive habitats as a result of changes in air quality from marine vessel and landside plant emissions	Not significant	N/A	Not significant	**High**

9.11 References

Ref 9-1 Cefas (2021). Shellfish Classification Zones of England and Wales. [Online] Available at: http://data.cefas.co.uk/#/View/79.

Ref 9-2 Chartered Institute of Ecology and Environmental Management (CIEEM). (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland. [Online] Available at: https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.1Update.pdf

Ref 9-3 European Commission (1992). Council Directive 92 /43 /EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

Ref 9-4 European Commission (2009). Council Directive 2009/147/EC of 30 November 2009 on the conservation of wild birds.

Ref 9-5 European Commission (2000). Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

Ref 9-6 The Stationery Office (2017). Statutory Instrument 2017. No. 1012. The Conservation of Habitats and Species Regulations 2017.

Ref 9-7 The Stationery Office (2017). Statutory Instrument 2017 No. 407. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.

Ref 9-8 The Stationery Office Limited (2009). Marine and Coastal Access Act 2009.

Ref 9-9 The Stationery Office Limited (2008). Planning Act 2008.

Ref 9-10 The Stationery Office (1981). Wildlife and Countryside Act 1981.

Ref 9-11 The Stationery Office (2000). The Countryside and Rights of Way Act 2000.

Ref 9-12 The Stationery Office (2006). Natural Environment and Rural Communities Act 2006.

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9.12 Abbreviations and Glossary of Terms

Table 9.14: Glossary and Abbreviations

Term	Acronym	Definition
Appropriate Assessment	AA	The assessment of the impact on the integrity of a European site of a project or plan, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives.
Associated British Ports	ABP	One of the UK's leading and best-connected ports groups, owning and operating 21 ports across England, Wales and Scotland.
Biodiversity Action Plan	BAP	A Biodiversity Action Plan is an internationally recognised program addressing threatened species and habitats and is designed to protect and restore biological systems.
Department for Business, Energy and Industrial Strategy	BEIS	The Government department responsible for policy and regulations on business, energy and industry issues.
Biodiversity Net Gain	BNG	An approach that aims to leave biodiversity within the natural environment in a measurably better state than its condition prior to implementation of a project.
British Trust for Ornithology	BTO	The British Trust for Ornithology is an organisation founded in 1932 for the study of birds in the British Isles.
Centre for Environment, Fisheries and Aquaculture Science	Cefas	The Centre for Environment, Fisheries and Aquaculture Science is an executive agency of the United Kingdom government Department for Environment, Food and Rural Affairs.
Chartered Institute of Ecology and Environmental Management	CIEEM	The leading professional membership body representing and supporting ecologists and environmental managers in the UK, Ireland and abroad.
Countryside and Rights of Way Act 2000	CRoW	The Countryside and Rights of Way Act gives greater freedom for people to explore open countryside as well as provisions designed to reform and improve rights of way in England and Wales. Additionally, the Act gives greater protection to wildlife and natural features by making provision for the conservation of biological diversity, and by improving protection for Sites of Special Scientific Interest in England and Wales and the enforcement of wildlife legislation as well as the introduction of provisions to allow the

Term	Acronym	Definition
		better management and protection of Areas of Outstanding Natural Beauty.
Candidate Special Areas of Conservation	cSAC	A site proposed for designation under EU legislation for the protection of habitats and species considered to be of European interest.
Diadromous species	D	Species using estuaries as pathways of migration (for reproduction) between fresh waters and the sea; migration from fresh water to sea water to breed (catadromous species, e.g. eel), and in the opposite direction (anadromous species, e.g., salmonids and lampreys);
Decibel	dB	The scale used to measure noise is the decibel scale which extends from 0 to 140 decibels, corresponding to the intensity of the sound pressure level.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Department of Energy and Climate Change	DECC	The Department of Energy and Climate Change was a department of the Government of the United Kingdom created on 3rd October 2008 and became part of the Department for Business, Energy and Industrial Strategy in July 2016.
Department for Environment, Food and Rural Affairs	Defra	The Government department responsible for policy and regulations on environmental, food and rural issues. The department's priorities are to grow the rural economy, improve the environment and safeguard animal and plant health.
Department for Transport	DfT	The Department for Transport is the United Kingdom government department responsible for the English transport network.
European Commission	EC	An executive branch of the European Union.
Ecological Impact Assessment	EcIA	The process of identifying, quantifying and evaluating the potential impacts of defined actions on ecosystems or their components.
European Economic Community	EEC	The European Economic Community (EEC) was a regional organisation created by the Treaty of Rome of 1957 to create a common market for its members through the elimination of most trade barriers.
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.

Term	Acronym	Definition
European Marine Site	EMS	European Marine Sites are areas at sea, partly or completely covered by tidal water, which are protected by European law.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
Estuarine resident Species	ES	Species that are able to reproduce and complete their life cycle in the estuary; as such they are highly euryhaline species, able to move throughout the full length of the estuary
European Union	EU	An economic and political union of 28 countries which operates an internal (or single) market which allows the free movement of goods, capital, services and people between member states.
Freshwater species	F	Species of freshwater origin that regularly or accidentally enter estuaries, in moderate to low numbers, moving varying distances down the estuary but often restricted to low-salinity, upper reaches of estuaries and to periods of freshwater flooding
Feature of Conservation Importance	FOCI	Features of Conservation Importance are marine features that are particularly threatened, rare, or declining species and habitats.
Great Britain	GB	-
Humber International Terminal	HIT	A terminal located within the Port of Immingham.
Heavily Modified Water Body	HMWB	Significant water bodies that have changed water category due to modifications.
Habitats Regulations Assessment	HRA	An assessment of projects (or plans) potentially affecting European Sites in the UK, required under the Habitats Directive and Regulations. Also known as an assessment of implications on European Sites
The Institute of Estuarine & Coastal Studies	IECS	The Institute of Estuarine & Coastal Studies (IECS) is a multi-disciplinary Environmental Research Consultancy with experience in the marine, coastal and estuarine environment.
Institute of Environmental Management and Assessment	IEMA	A professional body for practitioners working in the fields of environmental management and assessment.

Term	Acronym	Definition
International Maritime Organisation	IMO	The International Maritime Organisation is a specialised agency of the United Nations responsible for regulating shipping.
Invasive Non-native Species	INNS	Non-native UK plants that are invasive, for example Japanese Knotweed.
Immingham Outer Harbour	IOH	Immingham Outer Harbour is an area which partly makes up infrastructure located at the Port of Immingham.
Immingham Oil Terminal	IOT	An oil terminal operating out of the Port of Immingham.
Improvement Programme for England's Natura 2000 Sites	IPENS	A programme to develop a strategic approach to achieving favourable condition on these sites by reviewing: the risks and issues that are impacting on and/or threatening the condition of the site.
Joint Cetacean Protocol	JCP	This survey was undertaken to inform the identification of discrete and persistent areas of relatively high harbour porpoise density in the UK marine area.
In-combination Climate Change Impacts	JNCC	The JNCC are the public body that advises the UK Government and devolved administrations on UK-wide and international nature conservation.
Lincolnshire Ecological Records Centre	LERC	A statutory designation made under Section 21 of the National Parks and Access to the Countryside Act 1949 by principal local authorities.
Local Geological Sites	LGS	Non-statutory geological sites considered worthy of protection for their earth science or landscape importance. Formerly known as Regionally Important Geological Sites.
Local Nature Reserve	LNR	A statutory designation made under Section 21 of the National Parks and Access to the Countryside Act 1949 by principal local authorities.
Likely Significant Effect	LSE	Schedule 4 of the Regulations requires an environmental statement to include a description of the likely significant effects of the development on the environment.
Local Wildlife Site	LWS	Non-statutory sites of nature conservation value that have been designated 'locally'. These sites are referred to differently between counties with common terms including site of importance for nature conservation, county wildlife site, site of biological importance, site of local importance and sites of metropolitan importance.

Term	Acronym	Definition
Multi-Agency Geographic Information for the Countryside	MAGIC	A website which provides geographic information about the natural environment.
Marine Aggregate Levy Sustainability Fund	MALSF	The Levy was introduced as a means to better reflect the environmental costs of winning primary construction aggregates, and to encourage the use of alternative, secondary and recycled construction materials.
Marine and Coastal Access Act 2009	MCAA	The Act introduces a new system of marine management. This includes a new marine planning system, which makes provision for a statement of the Government's general policies, and the general policies of each of the devolved administrations, for the marine environment, and also for marine plans which will set out in more detail what is to happen in the different parts of the areas to which they relate
Marine Conservation Zone	MCZ	Marine Conservation Zones are areas that protect a range of nationally important, rare or threatened habitats and species
Mean High Water Springs	MHWS	The height of Mean Water High Springs is the average throughout the year, of two successive high waters, during a 24-hour period in each month when the range of the tide is at its greatest.
Marine Migrant species	MM	Marine species that spawn at sea and regularly enter estuaries in large numbers, thus having a temporary residence in the estuarine habitat; they usually are highly euryhaline species, able to move throughout the full length of the estuary, and spending much of their life within estuaries, using these habitats as nursery grounds or visiting them regularly at sub-adult and adult life stages.
Marine Management Organisation	MMO	The Marine Management Organisation is an executive non-departmental public body in the United Kingdom established under the Marine and Coastal Access Act 2009, with responsibility for English waters.
Marine Policy Statement	MPS	The UK Marine Policy Statement provides the framework for preparing Marine Plans and is key when making decisions directly affecting the marine environment.
Marine Straggler species	MS	A category of fish that enter estuaries infrequently and usually in low numbers,
National Biodiversity Network	NBN	A collaborative venture in the United Kingdom, which facilitates access to biodiversity information.

Term	Acronym	Definition
Nationally Significant Infrastructure Project	NSIP	A type of project listed in the Planning Act 2008, which must be consented by a Development Consent Order.
Natural England	NE	Executive non-departmental public body constituted under the Natural Environment and Rural Communities Act 2006 (section 2(1)) to ensure that the natural environment is conserved, enhanced and managed for the benefit of present and future generations, thereby contributing to sustainable development.
Natural Environment and Rural Communities	NERC	The act created Natural England and the Commission for Rural Communities and, amongst other measures, it extended the biodiversity duty set out in the Countryside and Rights of Way Act to public bodies and statutory undertakers to ensure due regard to the conservation of biodiversity.
National Policy Statement for Ports	NPSfP	The National Policy Statement for Ports provides the framework for decisions on proposals for new port development.
OSPAR Convention	OSPAR	The Convention for the Protection of the Marine Environment of the North-East Atlantic.
Permanent Threshold Shift	PTS	A permanent reduction of the sensitivity of the ear, decreasing the ability of the ear to detect sound.
Planning Act 2008	PA	An Act of Parliament in the UK intended to speed up the process of approving major new infrastructure projects.
Polycyclic Aromatic Hydrocarbons	PAH	A polycyclic aromatic hydrocarbon is a chemical compound containing only carbon and hydrogen that is
Preliminary Environmental Information Report	PEIR	A report that compiles and presents the Preliminary Environmental Information gathered for a project.
The World Association for Waterborne Transport Infrastructure	PIANC	The World Association for Waterborne Transport Infrastructure is an international professional organisation founded in 1885.
Planning Inspectorate	PINS	An executive agency with responsibilities for planning appeals, national infrastructure planning applications, local plan examinations and other planning-related casework in England and Wales.
Particle Size Analysis	PSA	Particle size analysis is used to characterise the size distribution of particles in a given sample.

Term	Acronym	Definition
Potential Special Protection Areas	pSPA	These are potential site boundaries for SPAs. As a result of consultation there may be minor changes to the final boundary of the site once classified. A Special Protection Area (SPA) is the land designated under Directive 2009/147/EC on the Conservation of Wild Birds. Special Protection Areas (SPAs) are strictly protected sites classified in accordance with Article 4 of the EC Birds Directive, which came into force in April 1979.
Wetlands of international importance, designated under The Convention on Wetlands (Ramsar, Iran, 1971)	Ramsar	Wetlands of international importance designated under the Ramsar Convention
Regional Environmental Characterisation	REC	A regional assessment of the geology, ecology and archaeology of the seafloor using information gathered through desk based assessment, geophysical data and sampling surveys.
Roll On-Roll Off	Ro-Ro	A design to allow vehicles to drive on and drive off ships.
Royal Society for the Protection of Birds	RSPB	Nature conservation charity for the protection of birds.
Special Area of Conservation	SAC	Sites designated under EU legislation for the protection of habitats and species considered to be of European interest.
Small Cetaceans in European Atlantic Waters and the North Sea	SCANS	A series of large-scale surveys for cetaceans in European Atlantic waters was initiated in 1994 and continued in 2005 and 2007 with the purpose of providing estimates of abundance needed to put bycatch in a population context and to allow EU member States to discharge their responsibilities under the Habitats Directive.
Special Committee on Seals	SCOS	Sites designated under the European Directive on the Conservation of Wild Birds for the protection of birds in member states.
Sea Mammal Research Unit	SMRU	The parameter by which sound levels are measured in air. It is measured in decibels. The threshold of hearing has been set at 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dB at a distance of 1 metre and a change of 3dB in a time varying sound signal is commonly regarded as being just detectable. A change of 10dB is subjectively twice, or half, as loud.

Term	Acronym	Definition
Special Protection Area	SPA	Sites designated under the European Directive on the Conservation of Wild Birds for the protection of birds in member states.
Sound Pressure Levels	SPL	The parameter by which sound levels are measured in air. It is measured in decibels. The threshold of hearing has been set at 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dB at a distance of 1 metre and a change of 3dB in a time varying sound signal is commonly regarded as being just detectable. A change of 10dB is subjectively twice, or half, as loud.
Suspended Sediment Concentrations	SSC	Suspended sediment concentration is the total value of both mineral and organic material carried in suspension by a river.
Site of Special Scientific Interest	SSSI	Area of land notified by Natural England under section 28 of the Wildlife and Countryside Act 1981 as being of special interest due to its flora, fauna or geological or physiological features
Total Organic Carbon	TOC	Total Organic Carbon (TOC) is a measure of the total amount of carbon in organic compounds in pure water and aqueous systems.
Transitional and Coastal Waters	TraC	The transitional zone of water between river and sea.
Trailer Suction Hopper Dredger	TSHD	Trailer suction hopper dredgers are oceangoing vessels that can collect sand and silt from the seabed and transport it over large distances.
Temporary Threshold Shift	TTS	A noise-induced threshold shift that fully recovers over time.
United Kingdom	UK	-
Wildlife and Countryside Act 1981	WCA	This legislation protects various animals, plants, habitats in the UK.
Wetland Bird Survey	WeBS	The Wetland Bird Survey monitors non-breeding waterbirds in the UK.
Water Framework Directive	WFD	A European Union Directive which commits member states to achieve good status of all waterbodies (both surface and groundwater), and also requires that no such waterbodies experience deterioration in status. Good status is a function of good ecological and good chemical status, defined by a number of elements.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 10: Ornithology

Associated British Ports

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Table of contents

Chapter Pages

Tables

10 Ornithology

10.1 Introduction

10.1.1 This chapter presents the preliminary findings of the assessment of the likely effects of the Project on Ornithology.

10.1.2 There may be interrelationships related to the potential effects on Ornithology and other disciplines. Therefore, also refer to the following chapters:

a. **Chapter 7: Noise and Vibration**;

b. **Chapter 8: Nature Conservation (Terrestrial Ecology)**;

c. **Chapter 9: Nature Conservation (Marine Ecology)**;

d. **Chapter 16: Physical Processes**; and

e. **Chapter 17: Marine Water and Sediment Quality**.

10.1.3 Relevant aspects of the ornithology assessment presented in this chapter will inform the Water Framework Directive (WFD) Assessment and the Habitats Regulations Assessment (HRA) which will be prepared and included in the Environmental Statement (ES).

10.1.4 This chapter is also supported by the following figures in Volume III of the PEI Report:

a. **Figure 10.1:** Monitoring locations of coastal waterbird surveys in the vicinity of the Project;

b. **Figure 10.2:** Internationally and nationally designated conservation sites;

c. **Figure 10.3:** The 5-year mean peak number of birds in Sector C during different winter months; and

d. **Figure 10.4:** The broad distribution of coastal waterbirds in Sector C.

10.2 Approach to Assessment

Scope and Methods

10.2.1 An Environmental Impact Assessment (EIA) scoping exercise was undertaken in August 2022 to establish the form and nature of the Ornithology assessment, and the approach and methods to be followed.

10.2.2 The Scoping Report (**Appendix 1.A** of the PEI Report, Volume IV) records thevi findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on ornithology.

10.2.3 Following receipt of the Scoping Opinion (**Appendix 1.B** of the PEI Report, Volume IV) as to the information to be provided in the Environmental Statement, the requirements set out in **Table 10.1**: Scoping opinion comments on ornithology have been agreed with the Planning Inspectorate as those to be taken into account as part of the ongoing ornithology assessment.

Table 10.1: Scoping opinion comments on ornithology

Consultee	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	The Scoping Report proposes to scope out this matter [direct changes to waterbird bird foraging habitat as a result of the capital dredge and dredge disposal] as the dredge and disposal sites do not overlap the intertidal area and the seabed habitat is already highly dynamic and not known to support large populations of diving birds/ seabirds. The Inspectorate agrees this matter can be scoped out of the assessment given the low value of the habitat as a prey resource.	Scoping opinion noted.
	In the absence of agreement with Natural England, the Inspectorate does not agree that this matter [Indirect changes to intertidal feeding and roosting habitat as a result of the capital dredging] should be scoped out of the assessment because insufficient information has been provided to conclude that no significant effects would result from the scale of predicted changes on intertidal habitats. Evidence on this should be provided in the ES to demonstrate that there will be no likely adverse significant effects.	Noted. This pathway has been scoped into the assessment.
	The Scoping Report states that the resuspension of sediment 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. The Inspectorate agrees that there is unlikely to be an effect on coastal waterbird habitat and prey resources and this matter [changes to seabed habitats and species as a result of sediment deposition during piling] can therefore be scoped out of the assessment.	Scoping opinion noted.

Consultee	Summary of Response	How comments have been addressed in this chapter
	The Scoping Report states that the presence of the piled structures has the potential to result in changes to hydrodynamic and sedimentary processes but this is anticipated to be negligible and highly localised and marine habitats and species are not expected to be sensitive to this level of change. The Inspectorate does not agree to scope out this matter [indirect changes to seabed habitats and species as a result of changes to hydrodynamic and sedimentary processes due to the presence of the piles] from the assessment until the physical processes assessment and other evidence provides sufficient evidence that there will be no significant adverse effects on marine habitats and species.	Noted. This pathway has been scoped into the assessment.
	The Scoping Report states that during capital dredging and dredge disposal, there is potential for the dredging vessel to cause noise and visual disturbance for bird populations but that the area is subject to high levels of vessel movements from the regular disposal of maintenance dredge arisings and shipping and that any potential disturbance stimuli caused by the capital dredge disposal would be highly temporary and localised. The Scoping Report adds that these areas are also not known to support large populations of diving birds/ seabirds. The Inspectorate does not agree this matter [noise and visual disturbance during capital dredge disposal] should be scoped from the assessment because there is insufficient evidence to conclude that the additional noise and visual disturbance would not have a significant adverse effect on bird species because of noise and visual disturbance during capital dredge disposal.	Additional evidence and literature has been used to inform the PEI Report assessment and the pathway has been scoped out based on this additional information (**Table 10.11**).
Natural England	Bird survey data is required which covers the full period when significant numbers of birds are likely to be using the site, in order to inform a thorough assessment of the potential impacts	Terrestrial waterbird survey scope covers the passage period, with surveys being undertaken twice monthly at

Consultee	Summary of Response	How comments have been addressed in this chapter
	of the development. As the surveys which relate to Immingham Outer Harbour cover the period October to March this will not cover the passage periods, in particular, we know that the Autumn passage period (August and September) is likely to be significant for SPA birds in this part of the estuary. In addition, bird data will be required which covers the low tide period as well as the high tide period, in order to have sufficient data to assess the construction and operational effects of the Project. It is not currently clear if this is the case for the data from Immingham Outer Harbour. Therefore additional bird surveys are likely to be required which cover the passage periods (particularly August and September) and potentially the low tide period.	High Water between September 2022 and March 2023 inclusive. The coastal waterbird surveys started in winter 1997/98 and have been ongoing annually since then with winter surveys undertaken between October and March twice a month. During each survey, either four counts (November to February) or five counts (other months) are undertaken every two hours after high water. The most recent 5-years of data (2017/18 to 2021/22) has been analysed. In addition, the 2021/22 survey season started in August rather than October. The surveys have been continued on a monthly basis in 2022 rather than stopping in March as per previous years. Surveys are therefore undertaken during both high and low water periods with data available for both winter and passage months.
	Changes to intertidal feeding and roosting habitat at whatever scale need to be (b)quantified, Natural England seek clarification on the justification for scoping this impact out of EIA. Additional noise will disturb local bird populations. Natural England have not seen the bird surveys mentioned in para 9.3.3 but these along with additional surveys programmed will indicate the level of disturbance on notified bird populations.	Noted. All potential pathways relating to intertidal habitat loss or change have been scoped into the assessment.
	Per section 9.4.7[Operation - pathways scoped out].- Natural England seeks clarification on this comment ['No pathways during the operational phase are proposed to be scoped out of the EIA'], does this mean that all impacts scoped in during the construction phase are also scoped in during the operational phase?	Only the pathways that are scoped in under operation will be considered. No other relevant pathways have been identified.

Consultee	Summary of Response	How comments have been addressed in this chapter
	Again Natural England welcome the commitment to consult all statutory bodies.	Noted.

10.2.4 Having regard to the information presented within the Scoping Report (**Appendix 1.A** of the PEI Report, Volume IV), the Planning Inspectorate's Scoping Opinion (**Appendix 1.B** of the PEI Report, Volume IV) has also confirmed the Applicant's view that significant effects on waterbird foraging habitat from dredging and disposal activities; and seabed habitats and species as a result of sediment deposition during piling are unlikely. Accordingly, these matters will remain scoped out of consideration in the Environmental Statement.

10.2.5 To facilitate the impact assessment process and ensure consistency in the terminology of significance, a standard assessment methodology will be applied to determine the significance of effects within the ES (see **Chapter 5: EIA Approach**). This methodology has been developed from a range of sources, including relevant Environmental Impact Assessment (EIA) Regulations, the EIA Directive (2014/52/EU), statutory and non-statutory guidance, consultations and professional project experience. The assessment also follows the principles of relevant guidance, including the latest guidelines from the Institute of Environmental Management and Assessment (IEMA) (Ref 10-2), and the Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines for ecological impact assessment in the UK and Ireland (which combine advice for terrestrial, freshwater and coastal environments) (Ref 10-3). The methodology adopted is considered to be 'best practice'. The methodology is described in detail in **Chapter 5: EIA Approach** including definitions of sensitivity/importance of receptors and magnitude of change. In line with CIEEM guidelines ecological impacts are described in terms of their extent, magnitude, duration, frequency and timing, and the reversibility (recoverability).

Legislation, Policy and Guidance

10.2.6 **Table 10.2** presents the legislation, policy and guidance relevant to the Ornithology assessment and details how their requirements will be met.

Table 10.2: Relevant legislation, policy and guidance regarding Ornithology

Legislation / Policy / Guidance	Consideration within the PEI Report
Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora ('The Habitats Directive') (Ref 10-4)	
The Habitats Directive (92/43/EEC) is intended to help maintain biodiversity throughout the EU Member States by defining a common framework for the conservation of wild plants, animals and habitats of community interest. It established a network of Special Areas of Conservation (SAC) designated by Member States to conserve habitats and species (listed in Annexes I and II).	The Humber Estuary SAC and features are described in **Section 10.3**. A preliminary consideration of impacts on SAC habitats and potential indirect impacts on coastal waterbirds is provided in **Section 10.5**. A Habitats Regulations Screening report has been produced and is provided in **Appendix 9.C** (PEI Report Volume IV).
Council Directive 2009/147/EC on the conservation of wild birds ('The Birds Directive') (Ref 10-5)	
Directive 2009/147/EC on the conservation of wild birds is known as the 'Birds Directive'. It creates a	The Humber Estuary SPA and qualifying features are described in **Section 10.3**. A preliminary

Legislation / Policy / Guidance	Consideration within the PEI Report
comprehensive scheme of protection for all wild bird species. The Directive recognises that habitat loss and degradation are the most serious threats to the conservation of wild birds. It, therefore, places great emphasis on the protection of habitats for endangered as well as migratory species (listed in Annex I), especially through the establishment of a coherent network of Special Protection Areas (SPAs) comprising all the most suitable territories for these species.	consideration of impacts on coastal waterbirds which are features of these sites are outlined in **Section 10.5**. A Habitats Regulations Screening report has been produced and is provided in **Appendix 9.C** (PEI Report Volume IV)**.**
Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. (Ref 10-6)	
The Water Framework Directive (2000/60/EEC) (WFD) establishes a framework for the management and protection of Europe's water resources. The overall objectives of the WFD is to achieve *"good ecological and good chemical status*" in all inland and coastal waters by 2021 unless alternative objectives are set or there are grounds for time limited derogation. For example, where pressures preclude the achievement of good status (e.g. navigation, coastal defence) in heavily modified water bodies (HMWBs), the WFD provides that an alternative objective of "good ecological potential" is set.	The Project (and associated disposal sites) is located within the Humber Lower water body (ID: GB530402609201) (further described in **Chapter 17: Marine Water and Sediment Quality)**. A WFD compliance assessment will be prepared to support the DCO application.
Conservation of Habitats and Species Regulations 2017 as amended ('The Habitats Regulations') (Ref 10-7)	
The Habitats Directive and Birds Directive are transposed into UK law through the Conservation of Habitats and Species Regulations 2017 as amended, known as the "Habitats Regulations"[1]. The Habitats Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species' and the adaptation of planning and other controls for the protection of European Sites. The Regulations also require the compilation and maintenance of a register of European sites, to include SACs (classified under the Habitats Directive) and SPAs (classified under the Birds Directive). These sites	**Section 10.3** identifies protected coastal waterbird species. A preliminary consideration of impacts on these receptors are described in **Section 10.5**. A Habitats Regulations Screening report has been produced and is provided in **Appendix 9.C** (PEI Report Volume IV). This report will inform the consultation process and will aid the Competent Authority[2] in determining whether the Project has the potential for a likely significant effect (LSE) on the interest features and/or supporting habitat of a European/Ramsar site either alone or in-combination with other plans, projects and activities and, if so, will inform the requirement to undertake an Appropriate Assessment (AA) of the

1 Following the UK leaving the EU, the Conservation of Habitats and Species Regulations 2017 have been modified by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. Available at: https://www.legislation.gov.uk/uksi/2019/579/contents/made (accessed October 2021) (Ref 10-8).

2 The Secretary of State is the Competent Authority for the HRA under the UK Habitats Regulations.

Legislation / Policy / Guidance	Consideration within the PEI Report
form the Natura 2000 network. These regulations also apply to Ramsar sites (designated under the 1971 Ramsar Convention for their internationally important wetlands), candidate SACs (cSAC), potential Special Protection Areas (pSPA), and proposed and existing European offshore marine sites.	implications of the proposals in light of the site's conservation objectives.
Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 as amended (Ref 10-9)	
The Water Framework Directive (2000/60/EEC) is transposed into UK law through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 as amended, known as the Water Framework Regulations[3].	The Project (and associated disposal sites) is located within the Humber Lower water body (ID: GB530402609201) (further described in **Chapter 17: Marine Water and Sediment Quality)**. A WFD compliance assessment will be prepared to support the DCO application.
Marine and Coastal Access Act 2009 (MCAA) (Ref 10-10)	
The MCAA provides the legal mechanism to help ensure clean, healthy, safe, productive, and biologically diverse oceans and seas by putting in place a new system for improved management and protection of the marine and coastal environment. The MCAA established the Marine Management Organisation (MMO) as the organisation responsible for marine planning and licensing. The Project will require a Marine Licence for the elements of the works below Mean High Water Springs including dredging, disposal and placing or removing objects on or from the seabed. For NSIPs the Development Consent Order (DCO) where granted may include provision deeming a marine licence to have been issued under Part 4 of the Marine and Coastal Access Act 2009. The MMO is responsible for enforcing, post-consent monitoring, varying, suspending, and revoking any deemed marine licence(s) as part of the DCO.	Information relevant to the marine licensing process is provided in the PEI Report including characterisation of the ornithology baseline (**Section 10.3**) and a preliminary assessment of impacts (**Section 10.5**). MCZs are considered in **Chapter 9: Nature Conservation (Marine Ecology)**.
The Planning Act 2008 (PA2008) (Ref 10-12)	
Whilst the MCAA regulates marine licensing for works at sea, section 149A of the Planning Act 2008 enables an applicant for a DCO to include within the Order a Marine Licence which is	Information relevant to the marine licensing process is provided in the PEI Report including characterisation of the ornithology baseline (**Section 10.3**) and a preliminary assessment of impacts (**Section 10.5**).

[3] Following the UK leaving the EU, the main provisions of the WFD have been retained in English law through The Floods and Water (Amendment etc.) (EU Exit) Regulations 2019 (Ref 10-11).

Legislation / Policy / Guidance	Consideration within the PEI Report
deemed to be granted under the provisions of the MCAA.	MCZs are considered in **Chapter 9: Nature Conservation (Marine Ecology)**.
The Wildlife and Countryside Act 1981 (WCA) (Ref 10-13)	
The WCA is the principal mechanism for the legislative protection of wildlife in Great Britain. The WCA is the means by which the Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention), the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), the Birds Directive (79/409/EEC) and the Natural Habitats and Wild Fauna and Flora Directive (92/43/FFC) are implemented in Great Britain. The WCA applies to the terrestrial environment and inshore waters (0 to 12 nautical miles) and concerns the protection of wild animals and the designation of protected areas, including SSSIs.	**Section 10.3** identifies coastal waterbird species and supporting habitats which are protected under the WCA. A preliminary consideration of impacts on these receptors is provided in **Section 10.5**.
The Countryside and Rights of Way Act 2000 (CroW Act) (Ref 10-14)	
The CroW applies to England and Wales only. Part III of the CroW Act deals specifically with wildlife protection and nature conservation. The CroW Act places a duty on the Government to have regard for the conservation of biodiversity and maintain lists of species and habitats for which conservation steps should be taken or promoted, in accordance with the Convention on Biological Diversity. Schedule 9 of the CroW Act amends the SSSI provisions of the WCA, including increased powers for the protection and management of SSSIs. The provisions extend powers for entering into management agreements; place a duty on public bodies to further the conservation and enhancement of SSSIs; increase penalties on conviction where the provisions are breached; and include an offence whereby third parties can be convicted for damaging SSSIs.	A preliminary consideration of impacts on coastal waterbird species and assemblages, for which SSSIs have been designated, are presented in **Section 10.5**.
Natural Environment and Rural Communities Act 2006 (NERC Act) (Ref 10-15)	
The NERC Act came into force in October 2006. In addition to establishing Natural England (NE) as the body responsible for conserving, enhancing, and managing England's natural environment, the Act also made amendments to both the Wildlife and Countryside Act 1981 and the CroW Act 2000. For example, it extended the	A preliminary consideration of impacts to coastal waterbird species and supporting habitats which are protected under the NERC Act (priority species and habitats of principal importance) are presented in **Section 10.5**.

Legislation / Policy / Guidance	Consideration within the PEI Report
CroW Act's biodiversity duty to public bodies and statutory undertakers, and altered enforcement powers in connection with wildlife prosecution. In addition to this, the NERC Act contains a number of additional measures designed to help streamline delivery and simplify the legislative framework, such as changes to the remit and constitution of the Joint Nature Conservation Committee (JNCC), reconstitution of the Inland Waterways Amenity Advisory Council, and improving the governance arrangements for the National Parks. Section 41 of the NERC Act requires the SoS to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The list has been drawn up in consultation with NE, as required by the NERC Act.	
National Policy Statement for Ports (Ref 10-16)	
The National Policy Statement for Ports (NPSfP) provides the framework for decisions on proposals for new harbour facility developments that constitute an NSIP. This policy requires that in order to meet the requirements of the Government's policies on sustainable development, new port infrastructure should also, amongst other things, preserve, protect and where possible improve marine and terrestrial biodiversity, be adapted to the impacts of climate change and provide high standards of protection for the natural environment. As highlighted in paragraphs 5.1.4 and 5.1.5 of the NPSfP, where the development is subject to EIA, the applicant should ensure that the PEI Report clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity. As highlighted in paragraphs 5.1.8 and 5.1.9 of the NPSfP, developments should aim to avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives. They should also ensure that appropriate weight is attached to designated sites of international, national and local importance.	A preliminary consideration of impacts to coastal waterbird species and supporting habitats including those which are features of internationally, nationally and locally designated sites of ecological importance are presented in **Section 10.5**. Where appropriate, mitigation has been included and this is outlined in **Section 10.4**.

Legislation / Policy / Guidance	Consideration within the PEI Report
UK Marine Policy Statement (Ref 10-17)	
The UK Marine Policy Statement (MPS) is the framework for preparing marine plans and taking decisions affecting the marine environment. The MPS also sets out the general environmental, social and economic considerations that need to be taken into account in marine planning and provides guidance on the pressures and impacts that decision makers need to consider when planning for and permitting development in the UK marine areas. Paragraphs 3.1.7 and 3.1.8 of the MPS are relevant to the ecology assessment of the Project which, amongst other things, state that: *"Marine plan authorities and decision makers should take account of how developments will impact on the aim to halt biodiversity loss and the legal obligations relating to all MPAs, their conservation objectives, and their management arrangements…"* Marine plan authorities and decision-makers should take account of the regime for MPAs and comply with obligations imposed in respect of them. This includes the obligation to ensure that the exercise of certain functions contribute to, or at least do not hinder, the achievement of the objectives of an MCZ. This would also include the obligations in relevant legislation relating to SSSIs and sites designated under the Birds and Habitats Directives.	A preliminary consideration of impacts to coastal waterbird species and supporting habitats including those which are features of MPAs are presented in **Section 10.5**.
East Inshore and East Offshore Marine Plans (Ref 10-18)	
The East Inshore and East Offshore Marine Plans, which are collectively referred to as 'the East Marine Plans', were formally adopted on 2 April 2014. There are four policies within the East Marine Plans specifically related to nature conservation and ornithology.	Provides general guidance. See considerations of specific policies below.
Policy ECO1 - Cumulative impacts affecting the ecosystem of the East marine plans and adjacent areas (marine, terrestrial) should be addressed in decision-making and plan implementation:	Information on the cumulative and in-combination effects assessment for the Project are included in **Chapter 25: Cumulative and In-Combination Effects** of this PEI Report.
Policy BIO1 - Appropriate weight should be attached to biodiversity, reflecting the need to protect biodiversity as a whole, taking account of the best available evidence on those habitats and species that are protected or of conservation	A preliminary consideration of impacts to coastal waterbird species and supporting habitats are presented in **Section 10.5**.

Legislation / Policy / Guidance	Consideration within the PEI Report
concern in the East Marine Plans and adjacent areas (marine, terrestrial).	
Policy BIO2 **-** Where appropriate, proposals for development should incorporate features that enhance biodiversity and geological interests.	A preliminary consideration of design, mitigation and enhancement measures is outlined in **Section 10.4.**
Policy MPA1 - Any impacts on the overall MPA network must be taken into account in strategic level measures and assessments, with due regard given to any current agreed advice on an ecologically coherent network:	A preliminary consideration of impacts to coastal waterbird species and supporting habitats are presented in **Section 10.5**. A Habitats Regulations Screening report has been produced and is provided in **Appendix 9.C (**PEI Report, Volume IV). MCZs are considered in **Chapter 9: Nature Conservation (Marine Ecology)**.
North East Lincolnshire Local Plan 2013 to 2032 (Ref 10-19)	
The North East Lincolnshire Local Plan was adopted in 2018 and covers the period 2013 to 2032. Policy 7 of the plan highlights that for operational port areas *"proposals for port related use will be supported and, where appropriate, approved by the Council if the submitted scheme accords with the development plan as a whole and subject to the ability to satisfy the requirements of the Habitats Regulations."* In addition, Policy 41 of the plan states that: *"The Council will have regard to biodiversity and geodiversity when considering development proposals, seeking specifically to:* *A. establish and secure appropriate management of long-term mitigation areas within the Estuary Employment Zone, managed specifically to protect the integrity of the internationally important biodiversity sites (see Policy 9 'Habitat Mitigation - South Humber Bank');* *B. designate Local Wildlife Sites (LWSs) and Local Geological Sites (LGSs) in recognition of particular wildlife and geological value;* *C. protect manage and enhance international, national and local sites of biological and geological conservation importance, having regard to the hierarchy of designated sites, and the need for appropriate buffer zones;* *D. minimise the loss of biodiversity features, or where loss is unavoidable and justified ensure appropriate mitigation and compensation measures are provided;*	A preliminary consideration of impacts to coastal waterbird species and supporting habitats and designated sites are presented in **Section 10.5**. A Habitats Regulations Screening report has been produced and is provided in **Appendix 9.C** (PEI Report, Volume IV).

Legislation / Policy / Guidance	Consideration within the PEI Report
E. create opportunities to retain, protect, restore and enhance features of biodiversity value, including priority habitats and species; and, *F. take opportunities to retain, protect and restore the connectivity between components of the Borough's ecological network.* *Any development which would, either individually or cumulatively, result in significant harm to biodiversity which cannot be avoided, adequately mitigated or as a last resort compensated for, will be refused".*	

Stakeholder Engagement

10.2.7 A range of stakeholders have been engaged as part of the scoping process to obtain their views on the Project and the scope of the Ornithology assessment, the results of which are presented within the Scoping Opinion (**Appendix 1.B** of the PEI Report, Volume IV). This has included advice from Natural England which was provided alongside comments from the Planning Inspectorate as part of the scoping process. A meeting was held with Natural England on 23rd November 2022 to provide an overview of the Project and to discuss the impact pathways relevant to ornithology. Further engagement with statutory and non-statutory stakeholders will be carried out prior to submission of the DCO Application.

Limitations and Assumptions

10.2.8 The information presented in this preliminary assessment reflects that obtained and evaluated at the time of reporting, and is based on an emerging design for the Project and the maximum likely extents of land required for its construction and operation as outlined in **Chapter 2: The Project**.

10.2.9 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further through the assessment and consultation processes, and as further research and investigative surveys are completed to fully understand its potential effects.

10.2.10 This assessment has been undertaken based on the following assumptions:

a. The Project design and methodology, as detailed in **Chapter 2: The Project** and **Chapter 3: Need and Alternatives**;

b. The assessment of impacts relating to changes in hydrodynamic and sedimentary process is based on numerical modelling. Further modelling will be carried out to inform the ES; and

c. That during operation, periodic maintenance dredging will be required.

10.2.11 Whilst these are assumptions, the assessment within this PEI Report has been undertaken considering the anticipated worst-case scenario in respect of ornithology receptors at the dredge, piling and disposal locations.

10.2.12 Terrestrial breeding bird surveys have only been undertaken to date within the West Site area of the Site. Further breeding bird surveys will be undertaken in the spring/ summer 2023 survey season (five visits in the period March to May/ June) within the remaining areas of the Site that are suitable to support nesting birds; this is the triangle area of land off Queens Road and the band of mature deciduous woodland spanning Laporte Road (referred to as 'Long Strip'). Conclusions made in respect of breeding birds are therefore limited by the extent of survey work completed to date.

Study Area

10.2.13 The study area is the area over which potential direct and indirect effects of the Project may occur during construction and operation. The direct effects on ornithology receptors are those that occur within the footprint of the Project, such as the direct disturbance to supporting habitats and associated species as a result of the Project. Indirect effects are those that may arise outside this footprint, such as the potential noise and visual disturbance effects on waterbirds during construction.

10.2.14 The study area for coastal waterbirds is focused on the Port of Immingham area and proposed disposal sites with data for the wider Humber Estuary region presented where relevant to provide contextual information and to ensure the area of potential effects (e.g. noise disturbance) are fully considered. The study area for coastal waterbirds includes any terrestrial habitats adjacent to/ in close proximity to the Estuary that may support these species over the high tide period when intertidal habitats are reduced.

10.2.15 The study area for breeding birds (non-SPA/Ramsar species) includes terrestrial habitats within the red line boundary that have been identified as having the potential to support nesting species; this includes the scrub/ grassland within the West Site (surveyed in spring/summer 2022), and the scrub/ woodland within the Queens Road land, and the mature woodland within 'Long Strip' (to be surveyed in spring/summer 2023).

10.3 Baseline Conditions

Current Baseline

10.3.1 Current baseline conditions have been determined by a desk-based review of available information including:

a. Immingham Outer Harbour (IOH) Ornithology Surveys: Data from surveys carried out for a separate development (the IOH) have been used to inform the baseline for this Project as the IOH survey boundary overlaps with the Project area (**Figure 10.1** (PEI Report, Volume III)). The coastal waterbird surveys started in winter 1997/98 and have been ongoing annually since then with winter surveys undertaken between October and March twice a month[4].. During each survey, either four counts (November to February) or five counts

[4] Passage surveys have been undertaken on a weekly basis in March and April 2022 and will also be undertaken on a weekly basis from September to November 2022.

(other months) are undertaken every two hours after high water. The most recent 5-years of data (2017/18 to 2021/22) has been analysed. In addition, the 2021/22 survey season started in August rather than October. The surveys have been continued on a monthly basis in 2022 rather than stopping in March as per previous years. On this basis, the results from surveys covering passage and summer months (August and September 2021 and April to August 2022) have also been presented;

b. Wetland Bird Survey (WeBS) Core Counts Data: Core count data for data for 'Immingham Docks - Sector K' (ID 38905) which overlaps with the Project. These surveys are typically undertaken around high water. The most recent 5-years of data available from the British Trust for Ornithology (BTO) (2016/17 to 2020/21) has been analysed. In addition, estuary wide WeBS data for the Humber Estuary for 2015/16 to 2019/20 has also been reviewed to provide contextual information (Ref 10-20) [5];

c. Natural England Designated Sites Portal: Background information on the ecology of SPA qualifying bird species in the Humber Estuary (Ref 10-21);

d. Population Trends for Species in the Humber Estuary: Information on long-term trends in the population status of waterbirds in the Humber Estuary is available for the period up to 2016/2017 from the latest WeBS 'Alerts Report' (Ref 10-22). This is an information source describing waterbird numbers on protected areas and has an 'alert system' where species that have undergone major declines in numbers are identified; and

e. BTO Research Report Analysing WeBS data for the Humber Estuary: Population trends of waterbird species in different parts of the Humber Estuary for the period 2000/01 to 2016/17 (Ref 10-23).

Nature conservation sites and protected species

Designated sites

10.3.2 The Project falls within the boundaries of the Humber Estuary SAC, SPA and Ramsar site (collectively forming the Humber EMS; **Figure 10.2** (PEI Report, Volume III)). For the Humber Estuary SAC, the primary reason for designation is the presence of two broad scale habitats, 1130 Estuaries and 1140 Mudflats and sandflats not covered by seawater at low tide (Ref 10-24). These broad scale habitats support other more specific habitats which are qualifying features but not a primary reason for designation. These are:

a. 1110 Sandbanks which are slightly covered by sea water all the time;

b. 1150 Coastal lagoons (identified as a priority feature);

c. 1310 *Salicornia* and other annuals colonizing mud and sand;

d. 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*);

[5] 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.

e. 2110 Embryonic shifting dunes;

f. 2120 Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes');

g. 2130 Fixed coastal dunes with herbaceous vegetation ('grey dunes') (identified as a priority feature); and

h. 2160 Dunes with *Hippopha rhamnoides*.

10.3.3 Alongside the habitats for which the SAC is designated, there are also three mobile species listed on Annex II of the EU Habitats Directive (92/43/EEC) the Natural Habitats and Wild Fauna and Flora Directive) (Ref 10-4) included in the designation (Ref 10-24), namely:

a. 1095 Sea lamprey *Petromyzon marinus*;

b. 1099 River lamprey *Lampetra fluviatilis*; and

c. 1364 Grey seal *Halichoerus grypus*.

10.3.4 Qualifying features of the Humber Estuary SPA and Humber Estuary Ramsar site are shown in **Table 10.3** and **Table 10.4** respectively.

Table 10.3: Qualifying features of the Humber Estuary SPA

Internationally Important Populations	
Internationally Important Populations of Regularly Occurring Annex 1 Species	
Breeding Species Population	
Bittern *Botaurus stellaris*	2 calling males (10.5 % of the GB population)
Marsh Harrier *Circus aeruginosus*	10 breeding females (6.3 % of the GB population)
Avocet *Recurvirostra avosetta*	64 pairs (8.6 % of the GB population)
Little Tern *Sternula albifrons*	51 pairs (2.1 % of the GB population)
Wintering Species Population	
Bittern	4 (4.0 % of the GB population)
Hen harrier *Circus cyaneus*	8 (1.1 % of the GB population)
Bar-tailed Godwit *Limosa lapponica*	2,752 (4.4 % of the GB population)
Golden Plover *Pluvialis apricaria*	30,709 (12.3 % of the GB population)
Avocet *Recurvirostra avosetta*	54 (1.7 % of the GB population)

Internationally Important Populations	
On passage Species population	
Ruff *Calidris pugnax*	128 (1.4 % of the GB population)
Internationally Important Populations of Regularly Occurring Migratory Species	
Wintering Species Population	
Teal† *Anas crecca*	2,322 (<1 % of the population)
Wigeon† *Mareca penelope*	5,044 (<1 % of the population)
Mallard† *Anas platyrhynchos*	2,456 (<1 % of the population)
Turnstone† *Arenaria interpres*	629 (<1 % of the population)
Common Pochard† *Aythya ferina*	719 (<1 % of the population)
Greater Scaup† *Aythya marila*	127 (<1 % of the population)
Brent Goose† *Branta bernicla*	2,098 (<1 % of the population)
Goldeneye† *Bucephala clangula*	467 (<1 % of the population)
Sanderling† *Calidris alba*	486 (<1 % of the population)
Dunlin *Calidris alpina*	22,222 (1.7 % of the Northern Siberia/Europe/Western Africa population)
Red Knot *Calidris canutus*	28,165 (6.3 % of the North-eastern Canada/Greenland/Iceland/North-western Europe population)
Ringed Plover† *Charadrius hiaticula*	403 (<1 % of the population)
Oystercatcher† *Haematopus ostralegus*	3503 (<1 % of the population)
Black-tailed Godwit *Limosa*	1,113 (3.2 % of the Icelandic Breeding population)
Curlew† *Numenius arquata*	3,253 (<1 % of the population)
Grey Plover† *Pluvialis squatarola*	1,704 (<1 % of the population)
Shelduck *Tadorna tadorna*	4,464 (1.5 % of the North-western Europe population)
Redshank *Tringa totanus*	4,632 (3.6 % of the Eastern Atlantic Wintering population)
Northern Lapwing† *Vanellus vanellus*	22,765 (<1 % of population)

Internationally Important Populations	
On passage Species Population	
Sanderling†	818 (<1 % of the population)
Dunlin	20,269 (1.5 % of the Northern Siberia/Europe/Western Africa population)
Red Knot	18,500 (4.1 % of the North-eastern Canada/Greenland/Iceland/North-western Europe population)
Ringed Plover†	1,766 (<1 % of the population)
Black-tailed Godwit	915 (2.6 % of the Icelandic Breeding population)
Whimbrel† *Numenius phaeopus*	113 (<1 % of the population
Grey Plover†	1,590 (<1 % of the population)
Greenshank† *Tringa nebularia*	77 (<1 % of the population)
Redshank	7,462 (5.7 % of the Eastern Atlantic Wintering population)
Internationally Important Assemblage of Waterfowl	
Waterfowl assemblage	153,934 waterfowl
†Species with this symbol do not represent a population that is > 1 % of the international threshold but are included in the waterfowl assemblage.	

Source: Ref 10-25

Table 10.4: Qualifying marine features of the Humber Estuary Ramsar Site

Ramsar Criterion
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.
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.

Ramsar Criterion	
Criterion 5 – Bird Assemblages of International Importance	
Wintering waterfowl	153,934 waterfowl (5-year peak mean 1998/99-2002/23)
Criterion 6 – Bird Species/Populations Occurring at Levels of International Importance	
Species	Spring/Autumn Population (5-year peak mean 1996-2000)
Golden Plover	17,996 (2.2 % of the Iceland & Faroes/East Atlantic population)
Red Knot	18,500 (4.1 % of the West & Southern African wintering population)
Dunlin	20,269 (1.5 % of the West Siberia/West Europe population)
Black-tailed Godwit	915 (2.6 % of the Iceland/West Europe population)
Redshank	7,462 (5.7 % of the population)
Species	Wintering Population (5-year peak mean 1996/97-2000/01)
Shelduck	4,464 (1.5 % of the North-western Europe Population)
Golden Plover	30,709 (3.8 % of the Iceland & Faroes/East Atlantic population)
Red Knot	28,165 (4.1 % of the West & Southern African wintering population)
Dunlin	22,222 (1.7 % of the West Siberia/West Europe population)
Black-tailed Godwit	1,113 (3.2 % of the Iceland/West Europe population)
Bar-tailed Godwit	2,752 (2.3 % of the West Paleartic population)
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.	

Source: Ref 10-26

10.3.5 The Greater Wash SPA is designated for a range of seabird and diving bird species and is located approximately 20 km from the Project. Qualifying features of this site is shown in **Table 10.5**.

Table 10.5: Qualifying marine features of the Greater Wash SPA

Internationally Important Populations	
Internationally Important Populations of Regularly Occurring Annex 1 Species	
Breeding Species Population	
Little Tern *Sternula albifrons*	798 pairs (42 % of GB breeding population)
Common Tern *Sterna hirundo*	510 pairs (5.1% of GB breeding population)
Sandwich Tern *Sterna sandvicensis*	852 pairs (35% of GB breeding population)
Wintering Species Population	
Little Gull *Hydrocoloeus minutus*	1,255 (no current GB population estimate)
Red-throated Diver *Gavia stellata*	1,407 (8.3% of GB non-breeding population)
Internationally Important Populations of Regularly Occurring Migratory Species	
Common Scoter *Melanitta nigra*	3,449 (0.6% of biogeographic population)

Source: Ref 10-27

10.3.6 The Humber Estuary Site of Special Scientific Interest (SSSI) overlaps part of Study Area. This is designated for its nationally important habitat assemblage (intertidal mudflats and sandflats, and coastal saltmarsh) geological interest, importance to breeding, wintering and passage birds, breeding grey seal and the presence of river and sea lamprey.

10.3.7 North Killingholme Haven Pits SSSI is located approximately 6km away from the Study Area. This SSSI comprises saline lagoon habitats and supports important populations of waders including Black-tailed Godwits and Redshank. The Lagoons SSSI is located approximately 20 km from the Site and supports a variety of coastal habitats (such as saline lagoons and sand dunes) and well as a population of breeding Little Terns.

10.3.8 The nearest Local Nature Reserve (LNR) is Cleethorpes Sands LNR (located approximately 13 km south east of the Site) which supports a variety of intertidal and coastal habitats.

H5 Protected species

10.3.9 The *Wildlife and Countryside Act (1981) (as amended)* (WACA) (Ref 10-13) protects various animals, plants, habitats in the UK including bird species. In addition, all naturally occurring wild bird species, their eggs, nests and habitats are strictly protected under the Birds Directive.

10.3.10 Some marine fauna and habitats are listed as priority species and habitats of principle importance in England, as required under Section 41 of the *Natural Environment and Rural Communities (NERC) Act (2006) (England)* (Ref 10-15). Species of principle importance which are of relevance to the Humber Estuary

include various species of waterbird. Habitats of principle importance of relevance to the Humber Estuary include supporting habitat for waterbirds including intertidal mudflats and coastal saltmarsh.

Coastal waterbirds

Humber Estuary overview

10.3.11 The Humber Estuary is a site of national and international importance for its waders and wildfowl (ducks and geese) populations, regularly supporting over 130,000 waterbirds during winter and passage periods (Ref 10-20; Ref 10-23).

10.3.12 Waterbird numbers are highly variable in the Humber Estuary throughout the year, but it is considered to be an important site year-round due to the presence of different populations of wintering, passage and breeding birds which move into and out of the estuary. In general, numbers of coastal waterbirds are at their lowest during June, when the assemblage is dominated by wildfowl, before numbers start increasing during July due to the return of waders such as Dunlin. Golden Plover starts to become more abundant in late summer. The arrival of wintering waterfowl such as Pink-footed Geese and Wigeon as well as wader species such as Knot typically occurs in early autumn. Numbers start to fall in late winter with the departure of species such as Golden Plover and Knot, before increasing slightly in spring as passage flocks start to move through the area and wildfowl depart (Ref 10-21).

10.3.13 **Table 10.6** provides summary ecology information on key waterbird species occurring in the Humber Estuary in intertidal and marine habitats. This includes the 5-year estuary-wide mean peaks for these species for 2015/16 to 2019/20 (the most recent 5-years of data available from the BTO) (Ref 10-20)[6].

[6] It should be noted that as a result of COVID-19 lockdowns, the BTO were unable to undertake a full survey programme 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.

Table 10.6: Summary information for key species of coastal waterbird in the Humber Estuary

Species group	Species	Feeding behaviour in the marine environment [1]	Diet [2]	Distribution in the Humber Estuary [3]	Month of peak count [4]	WeBS Core Count 5-year estuary-wide mean peaks (2015/16 to 2019/20) [5]
Wader	Golden Plover	Roosts but rarely feeds in the intertidal	Mainly insects, especially beetles, as well as other invertebrates and some plant material.	Golden Plover mainly uses the estuary to roost in areas including Alkborough Flats, Whitton Sands, Blacktoft Sands, Read's Island in the Inner Humber Estuary and Salt End, Stone Creek, Paull Holme Stray, Cherry Cobb Sands and Pyewipe in the Middle Humber.	Oct-Dec	31,237
	Knot	Intertidal benthivore	Mainly molluscs, including the bivalve *Limecola balthica*, cockles *Cerastoderma edulis* and mud snail *Peringia ulvae*, the latter especially in early winter. Diet proportions of 75 % bivalves, 1 % worms and 24 % 'other'. Prey is eaten whole and crushed within the gizzard.	Knot is found in the outer Humber including Cherry Cobb Sands and the Lincolnshire coast south of Grimsby. Easington Lagoons provide an important roost site for Knot during high spring tides.	Jan, Mar, Nov-Dec	22,500

Species group	Species	Feeding behaviour in the marine environment [1]	Diet [2]	Distribution in the Humber Estuary [3]	Month of peak count [4]	WeBS Core Count 5-year estuary-wide mean peaks (2015/16 to 2019/20) [5]
	Lapwing	Roosts but rarely feeds in the intertidal	Wide range of invertebrates including beetles and earthworms.	Lapwing mainly uses the estuary to roost in areas including Alkborough Flats, Whitton Sands, Blacktoft Sands and Read's Island in the Inner Humber Estuary as well as Salt End, Stone Creek, Paull Holme Stray, Cherry Cobb Sands and Pyewipe (all Middle Humber Estuary). The majority of feeding occurring inland, though some feeding on intertidal areas takes place during July to September.	Jan-Feb, Dec	16,453
	Dunlin	Intertidal benthivore	Oligochaetes, polychaete worms (such as *Hediste diversicolor, Nephtys* spp., *Pygospio elegans* and *Scoloplos armiger*), bivalves (such as *Limecola balthica*) and the mud snail *Peringia ulvae*. Diet proportions of 70 % worms, 14 % bivalves and 16 % 'other'.	Widespread with important areas including Read's Island (Inner Humber Estuary), Cherry Cobb Sands, Pyewipe, Stone Creek and Salt End (all Middle Humber Estuary) and Saltfleet (Outer Humber Estuary).	Aug, Nov-Dec	15,954

Species group	Species	Feeding behaviour in the marine environment [1]	Diet [2]	Distribution in the Humber Estuary [3]	Month of peak count [4]	WeBS Core Count 5-year estuary-wide mean peaks (2015/16 to 2019/20) [5]
	Oyster-catcher		Predominantly bivalves especially large cockles *Cerastoderma edule*, mussels *Mytilus edulis* and tellins *Limecola* spp. Diet might also include polychaete worms on mudflats and earthworms from wet fields.	Found predominantly in the Outer Humber Estuary. The most important areas for Oystercatcher are along the Lincolnshire coast.	Feb, Sep-Dec	5,816
	Black-tailed Godwit		Invertebrates, including beetles, polychaete worms (such as *Hediste diversicolor, Nephtys, Pygospio elegans* and *Scoloplos armiger*), molluscs (such as *Limecola balthica)* crustaceans and some plant material.	Key areas include Pyewipe and North Killingholme Haven Pits for this species during winter.	Aug-Oct	4,545
	Grey Plover		Polychaete worms (such as *Hediste diversicolor* and *Arenicola marina*), bivalves (such as *Limecola*	Widespread usage across the Middle and Outer parts of the Humber Estuary. Typically, more usage of the north bank compared to the south bank. Particular key	Jan, Mar, May, Sep	3,179

Species group	Species	Feeding behaviour in the marine environment [1]	Diet [2]	Distribution in the Humber Estuary [3]	Month of peak count [4]	WeBS Core Count 5-year estuary-wide mean peaks (2015/16 to 2019/20) [5]
			balthica) and the muds snail *Peringia ulvae.*	areas include Cherry Cob Sands, and Welwick.		
	Redshank		Polychaete worms (such as *Hediste diversicolor, Nephtys spp., Pygospio elegans and Scoloplos armiger*), the bivalve *Limecola balthica,* crustaceans (such as brown shrimp *Crangon crangon and* mud shrimp *Corophium* spp.*) and* the mud snail *Peringia ulvae*. Will also consume terrestrial invertebrates, including insects and spiders. Diet proportions of 46 % worms, 7 % bivalves and 47 % 'other'.	Widespread with key areas including Cherry Cobb Sands and in the outer Humber Estuary.	Sep-Oct, Dec	2,881
	Curlew		Primarily bivalves (such as *Cerastoderma edule* and *Limecola balthica)*, the ragworm *Hediste diversicolo*r and lugworm *Arenicola marina).*	Important areas include Cherry Cobb sands and Patrington to Easington (Outer North), Read's Island (Inner Humber), Pyewipe, Salt End (both Middle Humber)	Jan, Jul, Sep	2,787

Species group	Species	Feeding behaviour in the marine environment [1]	Diet [2]	Distribution in the Humber Estuary [3]	Month of peak count [4]	WeBS Core Count 5-year estuary-wide mean peaks (2015/16 to 2019/20) [5]
			Earthworms on terrestrial habitats, Diet proportions during winter of 46 % bivalves, 35 % worms and 19 % 'other'.	and Theddlethorpe St. Helen (Outer South).		
	Avocet		Benthic crustaceans e.g. *Corophium* spp. and worms such as ragworm *H. diversicolo*r. Insects, especially Chironomidae larvae, in freshwater habitats.	Largest wintering flocks are present in the inner Humber around Far Ings/Read's Islands, close to the favoured locations for breeding.	Aug-Oct	2,479
	Bar-tailed Godwit		Polychaete worms are the principal food source during winter such as *Hediste diversicolor, Nephtys, Pygospio elegans and Scoloplos armiger*. Diet proportions comprise 94 % worms. Other species sometimes consumed include the shrimp *Crangon crangon* and bivalve *Limecola balthica.*	The most important sectors for Bar-tailed Godwit are the three sectors that make up the Outer (North) area, and the adjacent Cherry Cobb Sands (Middle Humber), and Paull Holme Strays (also Middle Humber).	Feb, Sep, Nov	1,561

Species group	Species	Feeding behaviour in the marine environment [1]	Diet [2]	Distribution in the Humber Estuary [3]	Month of peak count [4]	WeBS Core Count 5-year estuary-wide mean peaks (2015/16 to 2019/20) [5]
	Ringed Plover		In winter, mainly marine worms, crustaceans (such as *Corophium* spp.) and molluscs (such as *Peringia ulvae*).	Most commonly recorded in the Outer Estuary.	Aug-Sep	731
	Sanderling		Polychaete worms (such as *Hediste diversicolor*), crustaceans and insects. Diet proportions comprise 60 % worms, 1 % molluscs and 39 % 'other'.	Within the Humber Estuary, Sanderling are found exclusively in the outer estuary, particularly on the sandflats of the Lincolnshire coast.	May, Jul-Aug, Dec	579
	Turnstone		A wide range of invertebrates and other food sources. This includes polychaete worms and mudshrimp *Corophium* spp. on mudflats. Also feeds on rocky shore species, including mussels, amphipods, molluscs (such as periwinkles) and crabs. Diet proportions comprise 20 % bivalves,	Key areas for Turnstone include rocks around New Holland between Barton upon Humber and East Halton (Middle Humber) and between Grimsby and Cleethorpes (Outer South). Also feed on jetties and around the harbours.	Feb, Sep, Nov-Dec	239

Species group	Species	Feeding behaviour in the marine environment [1]	Diet [2]	Distribution in the Humber Estuary [3]	Month of peak count [4]	WeBS Core Count 5-year estuary-wide mean peaks (2015/16 to 2019/20) [5]
			5 % worms and 75 % 'other'.			
	Whimbrel		On passage the species consumes shrimps, molluscs, worm and crabs.	No obvious preferred areas, found throughout the Humber during migration periods.	Jul-Aug	110
	Ruff	Intertidal benthivore on mudflats but omnivores more generally	Omnivore feeding on insects, larvae, frogs, small fish and seeds.	The Humber Estuary is considered an important site for passage Ruff. The most important areas of the Humber for the ruff are the intertidal mud and sand flats and adjacent lagoons of Alkborough Flats and Blacktoft Sands with smaller numbers also observed wintering along the River Trent, at North Killingholme and at Tetney). During autumn, Paull Holme Strays, Sunk Island, Read's Island, New Holland and Whitgift Sand on the River Ouse are also important areas.	Aug-Oct	80
Water-fowl	Pink-footed Goose	Herbivorous waterfowl	Herbivorous. Outside the breeding season this species feeds on improved grasslands, cereal	Recorded mainly on Read's Island, which it uses as a roosting site, flying inland during the day to feed in fields.	Oct-Nov	14,345

Species group	Species	Feeding behaviour in the marine environment [1]	Diet [2]	Distribution in the Humber Estuary [3]	Month of peak count [4]	WeBS Core Count 5-year estuary-wide mean peaks (2015/16 to 2019/20) [5]
			stubbles and vegetables (e.g. potatoes, sugar beet, carrots).			
	Shelduck	Intertidal benthivore	Invertebrates, with small molluscs predominant in north and west Europe, especially mud snail *Peringia* spp. Other species consumed include the mud shrimp *Corophium volutator*, bivalves and polychaetes.	Shelduck are found throughout the estuary with key areas including Read's Island and Alkborough Flats (Inner Humber) and at Pyewipe, Salt End, Cherry Cobb Sands and Paull Holme Sands (Middle Humber).	Jul-Aug, Oct-Nov	4,515
	Teal	Omnivorous waterfowl	Seeds of saltmarsh and other wetland plants, including glasswort Salicornia spp. and oraches *Atriplex* spp., and invertebrates (especially small oligochaetes) sifted from the benthos.	Key areas include Alkborough Flats, Read's Island and Blacktoft Sands.	Sep-Nov	3,757
	Dark-bellied Brent Goose	Herbivorous waterfowl	Mainly grasses, and on arable land the shoots of winter cereals, and oilseed rape. On estuaries,	The North Lincolnshire coast between Tetney and Donna Nook is a key area. Spurn is also important during spring passage.	Jan, Nov-Dec	3,092

Species group	Species	Feeding behaviour in the marine environment [1]	Diet [2]	Distribution in the Humber Estuary [3]	Month of peak count [4]	WeBS Core Count 5-year estuary-wide mean peaks (2015/16 to 2019/20) [5]
			eelgrass *Zostera* spp. and saltmarsh plants.			
	Wigeon		Plants (leaves, stems, stolons, bulbils and rhizomes).	Alkborough Flats and Read's Island as well as Faxfleet to Brough Haven (also Inner Humber) are key areas.	Jan-Feb, Sep, Nov	2,672
	Greylag Goose		Grass, roots, cereal leaves and spilled grain.	Present within the Inner Humber to a greater extent (e.g. Faxfleet). Present in greatest numbers close to freshwater pools.	Aug-Sep, Nov	1,595
	Mallard	Omnivorous waterfowl	Omnivorous, including both plants and animal matter.	Occurs throughout Humber Estuary, with key areas including the River Ouse and Cherry Cobb Sands. The area around the outfall at New Holland is also a favoured area where the birds feed on grain spill from the dock.	Jan-Feb, Sep, Nov-Dec	1,046
	Barnacle Goose	Herbivorous waterfowl	The leaves and stems of grasses, roots and seeds.	Present on fields/arable land around the entire Humber Estuary in low densities.	Jan-Mar, Sep	878

Species group	Species	Feeding behaviour in the marine environment [1]	Diet [2]	Distribution in the Humber Estuary [3]	Month of peak count [4]	WeBS Core Count 5-year estuary-wide mean peaks (2015/16 to 2019/20) [5]
	Common Scoter	Benthivorous diving duck	Molluscs.	Present within the Outer Humber due to their more pelagic lifestyle. Occurs in passage and winter.	Mar, Oct-Dec	682
	Canada Goose	Herbivorous waterfowl	Roots, grass, leaves and seeds.	Occurs within the Inner Humber in the largest numbers. Present in greatest numbers close to freshwater pools.	Jun, Sep	641
	Goldeneye	Benthivorous diving duck	Mostly aquatic insects, molluscs and crustaceans. Occasional fish. Plant material generally less than 25 %.	Goxhill to New Holland and Barrow to Barton (including Barton Pits) are key areas.	Jan, Dec	329
Gull	Black-headed Gull	Omnivorous/ scavenging gull	Worms, insects, small fish, crustacea and carrion.	Widely distributed.	Aug-Sep	11,217
	Common Gull		Worms, insects, fish and carrion.	Widely distributed.	Aug-Oct, Dec	1,599
	Herring Gull		Carrion, offal, seeds, fruits, young birds, eggs, crustaceans, small mammals, insects and fish.	Widely distributed.	Jan, Apr, Sep, Dec	1,015

Species group	Species	Feeding behaviour in the marine environment [1]	Diet [2]	Distribution in the Humber Estuary [3]	Month of peak count [4]	WeBS Core Count 5-year estuary-wide mean peaks (2015/16 to 2019/20) [5]
	Great Black-backed Gull		Shellfish, birds and carrion.	Widely distributed.	Sep-Dec, Feb	292
Terns, and other diving birds	Sandwich Tern	Piscivorous plunge diver	Fish such as sandeels, sprats and whiting.	Widely distributed.	Jul-Aug	686
	Common Tern		Fish and crustaceans in some areas.	Widely distributed.	Aug-Sep	476
	Cormorant	Piscivorous pursuit diver	Feeds on fish such as flatfish, blennies gadoids, sandeel, salmonid and eels.	Widely distributed.	Jan-Feb, Sep, Nov	323
	Red-throated Diver	Piscivorous pursuit diver	Diet consists predominantly of fish (mainly clupeids, mackerels, flatfish, gadoids and sand eels).	Recorded mainly in the outer Humber Estuary and approaches.	Jan-March	39

1. Feeding behaviour based on Ref 10-28 and Ref 10-29:

Intertidal benthivore: Waterbird species feeding on infaunal and/or epibenthic invertebrates in intertidal habitats;

Herbivorous waterfowl: Geese, swans and ducks feeding on plant material;

Omnivorous waterfowl: Ducks feeding on a range of animal and plant food;

Species group	Species	Feeding behaviour in the marine environment [1]	Diet [2]	Distribution in the Humber Estuary [3]	Month of peak count [4]	WeBS Core Count 5-year estuary-wide mean peaks (2015/16 to 2019/20) [5]
Benthivorous diving duck: Diving ducks/seaducks feeding on epibenthic and infaunal invertebrates on the seabed; Omnivorous/scavenging gull: Gulls feeding on a range of animal and plant food including through scavenging; Piscivorous plunge diver: Seabirds foraging for fish through plunge diving; and Piscivorous pursuit diver: Seabirds foraging for fish through pursuit diving. 2. Based on Ref 10-30; Ref 10-31 and Ref 10-32. 3. Based on Ref 10-31 and Ref 10-33 4. Months when peaks count occurred in the 2015/16 to 2019/20 estuary-wide BTO Core Counts (Ref 10-20). 5.Data from Ref 10-20.						

10.3.14 The most abundant wading bird species recorded in the Humber Estuary are Golden Plover and Knot (5-year mean peak for 2015/16 to 2019/20 of 31,237 and 22,500 birds respectively). Other wading birds occurring in large numbers include Lapwing (5-year mean peak of 16,453 birds) and Dunlin (5-year mean peak of 15,954 birds) as well as Oystercatcher, Black-tailed Godwit, Grey Plover, Curlew, Avocet and Bar-tailed Godwit (Ref 10-20). Important areas for feeding and roosting waders include the Pyewipe frontage on the south bank and Paull Holme, Cherry Cobb, Foulholme, Spurn and Sunk Island Sands on the north bank of the Humber Estuary. In the inner section of the Humber Estuary, sites such as Blacktoft Sands, Alkborough and Read's Island Flats are considered important (Ref 10-21). The numbers of different waders in the Humber Estuary can show a high degree of interannual variation with some species (such as Black-tailed Godwit, Avocet, Oystercatcher) showing an overall long-term increase in estuary wide numbers with other species such as Dunlin, Redshank and Knot showing an overall decline (Ref 10-31; Ref 10-22).

10.3.15 Key prey items for waders on the Humber Estuary include annelid worms (such as ragworm *Hediste diversicolor, lugworm Arenicola marina, Pygospio elegans, Streblospio shrubsolii, Tubificoides spp., and Nephtys spp), the bivalves Cerastoderma edule and Limecola balthica, the mudsnail Peringia spp. and mud shrimp Corophium spp* (Ref 10-30; Ref 10-31).

10.3.16 The most abundant wildfowl bird species recorded in the Humber Estuary are Pink-footed Goose and Shelduck (5-year mean peak of 14,345 and 4,515 birds respectively). The number of Shelduck in the Humber Estuary has remained relatively stable with Pink-footed Goose showing a long-term increase (Ref 10-23; Ref 10-22). Other commonly occurring wildfowl include Teal, Dark-bellied Brent Geese, Wigeon, Greylag Goose and Mallard (Ref 10-20). Pink-footed Goose are recorded in large numbers at Read's Island with Dark-bellied Brent Geese and Wigeon, principally occur in areas along the southern shore from Cleethorpes to Saltfleetby (Ref 10-21).

10.3.17 Black-headed Gull (5-year mean peak of 11,217 birds) as well as Herring Gull and Common Gull (occurring in lower numbers) are widespread in the Humber Estuary.

10.3.18 The Humber Estuary also supports several heron species including Grey Heron, Little Egret and Great Bittern. Grey Heron and Little Egret are recorded in a wide variety of intertidal and coastal habitats with Great Bittern recorded within reedbed habitats such as around Blacktoft Sands, Far Ings, Barton and North Killingholme Haven clay pits (Ref 10-21).

10.3.19 Diving birds occurring in the Humber Estuary include Common Scoter and Goldeneye (5-year mean peak of 682 and 329 birds respectively) with Cormorants and Tufted Duck also occurring in relatively large numbers.

10.3.20 Little Tern breed at Easington Lagoon, which is located approximately 20 km from the Project (Ref 10-21), with data suggesting this species forages within 5 km of nesting sites (Ref 10-34. Sandwich Tern (5-year mean peak of 686 birds) and Common Tern (5-year mean peak of 476 birds) are also regularly recorded, particularly in passage periods in the Humber Estuary.

Immingham area

10.3.21 Pre and post consent monitoring of coastal waterbird surveys as part of the IOH development have been undertaken annually since winter 1997/98. The foreshore in the area of the Project overlaps with 'Sector C' (between the Immingham Oil Terminal Jetty and Oldfleet Drain (as shown in **Figure 10.1** (PEI Report, Volume III)). The most recent 5-years of data (2017/18 to 2021/22) has been analysed for this sector (Table 10.6). During this period, surveys were undertaken between October and March twice a month[7]. During each survey, either five counts (October and March) or four counts (November to February) were undertaken every two hours after high water. In addition, the 2021/22 survey season started early in August rather than October. The surveys have continued on a monthly basis in 2022 rather than stopping in March as per previous years. On this basis, the results from passage and summer months (August and September 2021 and April to August 2022) have been presented separately (Table 10.7).

10.3.22 To summarise the findings from the survey work, the annual peak count (maximum count from each winter period between October and March) for birds feeding, roosting as well as the combined total[8] is presented in **Table 10.6**. The 5-year average of the annual peak counts for each species (referred to as the mean peak)[9] is also presented in **Table 10.6**. This table also compares the 5-year mean peak against the thresholds and values outlined below, to provide objective criteria to help determine the value of the area in an international, national and regional context:

a. **Internationally Important Threshold Level**: The threshold for an individual species (or subspecies) is set at 1% of the biogeographic population[10];

b. **Nationally Important Threshold Level:** The threshold for an individual species (or subspecies) is set at 1% of the British population i.e. if a site supports more than 1% of the British population it is considered Nationally Important (for that species or subspecies); and

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7 Passage surveys have been undertaken on a weekly basis in March and April 2022 and will also be undertaken on a weekly basis from September to November 2022 to provide further data on abundances during these periods.

8 The combined peak count is a summed value derived from the largest count of both feeding and roosting birds during the same hourly count.

9 It is standard practice to present the average of the annual peaks for a certain duration of time (sometimes referred to as the mean of peaks). This is calculated as the average of the maximum annual counts and for the most recent 5-years of available data if possible. Mean peaks (using five years of winter values) is the approach presented in the WeBS annual reports. For most migratory species, the WeBS 5-year mean of peak is also the value that is used when identifying qualifying features for each SPA. Using mean of peaks is also useful for characterising the relative importance of sectors within a site, as it gives a good indication of how many individuals of a given species a sector typically supports (Ref 10-35).

10 The thresholds levels are available at: https://www.bto.org/volunteer-surveys/webs/data/species-threshold-levels. It should be noted that, where 1 % of the population is less than 50 birds, 50 is normally used as a minimum qualifying threshold for the designation of sites of national or international importance (accessed 04/04/22) (Ref 10-36).

c. **Latest Humber Estuary WeBS Core Counts 5-year average:** The 5-year mean peak from the latest Humber Estuary WeBS Core Counts. Core Count surveys are typically undertaken around high water. Within this assessment, this is from 2015/16 to 2019/20 (Ref 10-20). 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. For the purposes of this assessment, numbers representing more than 10 % of the estuary-wide Core Counts for an individual species are considered regionally important and numbers representing between 1 % and 10 % are considered locally important [11].

10.3.23 The 5-year mean peak number of birds in Sector C during different months is presented in **Figure 10.3** (PEI Report, Volume III) to show any seasonal trends over the winter period. The distribution of birds within Sector C based on distribution data collected in the surveys is shown in **Figure 10.4** (PEI Report, Volume III).

10.3.24 During the surveys, over 25 waterbird species have been recorded on the foreshore within Sector C with approximately 20 species considered regularly occurring.

10.3.25 The most numerous wading bird species recorded foraging within the area over this period were Black-tailed Godwit and Dunlin (5-year mean peaks of 1361 and 519 birds respectively). It should be noted that during winter 2017/18, 2018/19 and 2019/20 Black-tailed Godwit were recorded in nationally important numbers (503, 944 and 752 birds respectively) and in internationally important numbers in 2020/21 and 2021/22 (2016 and 2591 birds respectively) (**Table 10.7**). Other wading birds regularly recorded but in lower numbers included Bar-tailed Godwit, Redshank, Turnstone, Oystercatcher and Curlew. Shelduck were the most abundant wildfowl species recorded foraging (5-year mean peak of 131 birds). Lower numbers of other ducks such as Teal and Mallard were also recorded.

10.3.26 With respect to roosting birds, Black-tailed Godwit was the most numerous species recorded (5-year mean peaks of 514 birds). Other species regularly recorded roosting included Shelduck and Curlew (5-year mean peak of 32 and 27 birds, respectively) as well as Knot, Redshank and Turnstone.

[11] The 1% local threshold has been requested to be used in the baseline data analysis by Natural England as part of previous developments on the Humber Estuary.

Table 10.7: Coastal waterbird species recorded within Sector C during the last five winters

Species	Peak count per winter (feeding)						Peak count per winter (roosting)						Peak count per winter (combined – non-behavioural)					
	17/18	18/19	19/20	20/21	21/22	MP	17/18	18/19	19/20	20/21	21/22	MP	17/18	18/19	19/20	20/21	21/22	MP
Avocet			42	2		9			64			13			64	2		13
Black-headed Gull					83	17											83	17
Bar-tailed Godwit	48	30	54	45	141	64		2		3		1	48	30	54	45	141	64
Black-tailed Godwit	503	944	752	2016	2591	1361	280	1	1352	700	238	514	503	944	1352	2016	2591	1361
Common Gull					1	<1					8	2					8	2
Cormorant							1	1				<1	1	1				<1
Curlew†	23	35	24	35	37	31	37	11	14	57	16	27	37	35	24	57	37	31
Dunlin	541	371	571	554	556	519	16	9	110	6	4	29	541	371	571	554	556	519
Great Black-Backed Gull					1	<1											1	<1
Gadwall			1			<1									1			<1

Species	Peak count per winter (feeding)						Peak count per winter (roosting)						Peak count per winter (combined – non-behavioural)					
	17/18	18/19	19/20	20/21	21/22	MP	17/18	18/19	19/20	20/21	21/22	MP	17/18	18/19	19/20	20/21	21/22	MP
Golden Plover					13	3				4		1				4	13	3
Goldeneye					1	<1											1	<1
Grey Plover†	14		11	20	75	24				1		<1	14		11	20	75	24
Herring Gull					13	3					2	<1					13	3
Knot		191	110	16	39	71			210	2		42		191	210	16	39	71
Lapwing†							1		1			<1	1		1			<1
Lesser Black-backed Gull					2	<1					2	<1					2	<1
Little Egret			3			1									3			1
Mallard†	3	2	3			2	2		2	2		1	3	2	3	2		2
Oystercatcher†	5	4	9	7	7	6	2	2	2	7	2	3	5	4	9	7	7	6
Pink-footed Goose										1		<1				1		<1

Species	Peak count per winter (feeding)						Peak count per winter (roosting)						Peak count per winter (combined – non-behavioural)					
	17/18	18/19	19/20	20/21	21/22	MP	17/18	18/19	19/20	20/21	21/22	MP	17/18	18/19	19/20	20/21	21/22	MP
Redshank	56	38	50	48	80	54	26	5	12	13	44	20	56	38	50	48	80	54
Ringed Plover†	2	3	12	25	2	9	13	1	7	22	16	12	13	3	12	25	16	12
Shelduck	109	152	125	139	128	131	16	26	64	35	18	32	109	152	125	139	128	131
Teal†	1	8	13	3		5							1	8	13	3		5
Turnstone†	19	15	21	28	32	23	5		15	18	17	11	19	15	21	28	32	23
Yellow-legged Gull					1	<1					76	15					76	15

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

	Cells highlighted green indicate the count is of local importance (> 1 %) of the current estuary wide WeBS 5-year MP.
	Cells highlighted orange indicate the count is of regional importance (> 10 %) of the current estuary wide WeBS 5-year MP.
	Cells highlighted blue indicate the count is of national importance. It should be noted that for Black-tailed Godwit the regional importance (> 10 % of the estuary wide WeBS 5-year MP – 455 birds) is higher than the national importance threshold (390 birds).
	Cells highlighted red indicate the count is of international importance.

10.3.27 As shown in **Figure 10.3** (PEI Report, Volume III), during the surveys, the largest numbers of wintering Black-tailed Godwit were recorded in October. The numbers of other wintering species were highly variable with no clear pattern.

10.3.28 The data collected during passage and summer periods (August to September 2021 and April to August 2022) recorded a range of species some of which were recorded in relatively large numbers (**Table 10.7**). The number of birds using Sector C was generally higher in the spring months (April to May) than in autumn passage months (August and September) with peak counts of 400 Dunlin and 581 Black-tailed Godwit recorded in the spring and 222 Dunlin and 160 Black-tailed Godwit in the autumn respectively. However, none of the peak counts during the passage period exceeded the winter mean peaks for the last five years.

10.3.29 All of the species observed in Sector C are frequently recorded in large numbers during both passage and winter periods in the Humber Estuary more widely with the estuary-wide peak abundances of passage birds typically showing a high degree of both monthly and annual variability. This would be expected given the more transient nature of passage birds with numbers fluctuating on a daily basis as birds arrive and depart from sites in the Humber Estuary (Ref 10-23).

10.3.30 Within Sector C, the largest numbers of waterbirds typically occur on mudflat in the east of the sector towards the Pyewipe mudflats near Grimsby. Within this area approximately 500 to 2000 Black-tailed Godwit, 100s of Dunlin as well as lower numbers (<50) of other species such as Shelduck, Redshank and Knot are regularly recorded (**Figure 10.4** (PEI Report, Volume III)).

10.3.31 Lower numbers of waterbirds are seen on the mudflat in the western section of Sector C (between the IOT Jetty and the mudflat fronting North Beck drain) including flocks of Black-tailed Godwit (typically < 100 birds), Turnstone, Curlew, Dunlin (typically<50-60 birds) as well as lower numbers of other species such as Oystercatcher, Redshank, Knot and Shelduck (<20 birds) (**Figure 10.4** (PEI Report, Volume III)).

10.3.32 The upper shore sea defences in the area are regularly used through the tide by individuals or small flocks of Turnstone (typically < 20 to 30 birds throughout the sector).

10.3.33 The assemblage recorded in the surveys is broadly similar to that recorded during the WeBS Core Counts for the period 2016/17 to 2020/21 (the most recent 5-years of data available from the BTO for the 'Immingham Docks Sector K'). The most commonly recorded species were Dunlin (mean peak of 165 birds), Redshank (mean peak of 83 birds), Black-tailed Godwit (mean peak of 47 birds) Shelduck (mean peak of 35 birds), Turnstone (mean peak of 44) and Curlew (mean peak of 11 birds). It is worth noting that this WeBS sector covers a much larger area than Sector C and so it is not directly comparable in terms of spatial

extent [12.] Core counts are also only typically undertaken around high water periods and so do not provide information through the tide or during low water periods.

[12] The sector includes foreshore adjacent to the Port of Immingham and also extents east of the IOT terminal jetty (https://app.bto.org/websonline/sites/data/sites-data.jsp#lon=-0.1652575&lat=53.6215984&zoom=14&type=BING) (Ref 10-37).

Table 10.8: Coastal waterbird species recorded within Sector C during August to September 2021 and April to August 2022

Species	Peak count per passage/summer month (feeding)							Peak count per passage/summer month (roosting)							Peak count per passage/summer (combined – non-behavioural)						
	Aug 21	Sept 21	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Aug 21	Sept 21	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Aug 21	Sept 21	Apr 22	May 22	Jun 22	Jul 22	Aug 22
Avocet			2	1													2	1			
Bar-tailed Godwit	2	3			248		3								2	3			248		3
Black Headed Gull			9	15	44	219	449			2	10	2	181	61			9	15	44	219	449
Black-tailed Godwit	66	160	581	106			39		13						66	160	581	106			39
Common Gull					20	21	1				6		5	34				6	20	21	34
Common Sandpiper	2					2		2							2					2	
Cormorant		1							1	1						1	1				
Curlew†	14	16	43	16	4	19	20	3	3	6	1	3	3	3	14	16	43	16	4	19	20
Dunlin	1	222	400				47	2	3						2	222	400				47
Golden Plover			12														12				

Species	Peak count per passage/summer month (feeding)							Peak count per passage/summer month (roosting)							Peak count per passage/summer (combined – non-behavioural)						
	Aug 21	Sept 21	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Aug 21	Sept 21	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Aug 21	Sept 21	Apr 22	May 22	Jun 22	Jul 22	Aug 22
Great Black-backed Gull			8	4		4	2					1					8	4	1	4	2
Herring Gull			13	2	4	7	16			21	6	2	8	1			21	6	4	8	16
Knot		6	4	26	3											6	4	26	3		
Lesser Black-backed Gull			6	1	1	14	4			2			4				6	1	1	14	4
Little Egret	2	1		1			1		1			1			2	1		1	1		1
Little Ringed Plover	3														3						
Mallard†	1														1						
Oystercatcher†			5	5	3	3	3	2	1	2	2				2	1	5	5	3	3	3
Redshank	6	7	24			13	9		2	1					6	7	24			13	9
Ringed Plover†		1			2								2			1			2	2	
Shelduck	88	90	12	5	2	8	116		42	10			3		88	90	12	5	2	8	116
Turnstone†	16	41	8				16	6	12	5			5		16	41	8			5	16

Species	Peak count per passage/summer month (feeding)							Peak count per passage/summer month (roosting)							Peak count per passage/summer (combined – non-behavioural)						
	Aug 21	Sept 21	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Aug 21	Sept 21	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Aug 21	Sept 21	Apr 22	May 22	Jun 22	Jul 22	Aug 22
Whimbrel	1		4	3		1									1		4	3		1	

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

	Cells highlighted green indicate the count is of local importance (> 1 %) of the current estuary-wide WeBS 5-year MP.
	Cells highlighted orange indicate the count is of regional importance (> 10 %) of the current estuary-wide WeBS 5-year MP.
	Cells highlighted blue indicate the count is of national importance. It should be noted that for Black-tailed Godwit the regional importance (> 1% of the WeBS 5-year MP – 455 birds) is higher than the national importance threshold (39 birds). The national importance threshold for Common Sandpiper and Whimbrel is set as 1.

Terrestrial Habitats (Passage and Wintering SPA/Ramsar Waterbirds)

10.3.34 Habitats within the majority of the land impacted by the pipeline route are unsuitable for coastal waterbirds, as they comprise scrub/woodland that are not suitable for high tide roosting/loafing/feeding waterbirds, and areas of land currently used for port-related storage/ operational areas.

10.3.35 The habitat within the former arable land off Kings Road is dominated by tall-swarded grassland having been abandoned from agricultural cultivation approximately ten years ago. Consequently, the habitats within the West Site are not suitable for high tide roosting/loafing/feeding waterbirds from the nearby Humber Estuary SPA/Ramsar. This is because there is insufficient scanning distance for birds to observe approaching ground-based predators, and they therefore typically avoid taller swarded grassland. This conclusion is supported by the findings of a limited suite of wintering bird surveys undertaken to coincide with the high tide period in February and March 2022, which did not record any SPA/Ramsar waterbird species (**Appendix 8.B** of PEI Report, Volume IV). Previous wintering bird surveys of these fields were undertaken for a 2013 Drax planning application (planning reference: DM/1027/113/OUT) also did not record any SPA/Ramsar waterbirds, and the habitats were concluded to be unsuitable for waterbirds. Further survey of these habitats for wintering/ passage SPA/Ramsar waterbirds was therefore scoped out.

10.3.36 The large arable field adjacent to the Humber Estuary within the temporary compound area off Laporte Road may be suitable for coastal waterbirds, given its proximity to intertidal feeding habitats. Surveys are ongoing across the passage and wintering period of 2022/2023[13] and the findings will be presented in the ES. Where locally important aggregations of SPA/Ramsar waterbirds are recorded within this field (i.e. at numbers >1% of the WeBS 5 year mean peak count), it will be concluded that the field is functionally linked to the Humber Estuary.

Breeding SPA/ Ramsar Species

10.3.37 There is no suitable habitat within the Site for breeding SPA/Ramsar species Bittern, Marsh Harrier or Avocet. Marsh Harrier has been previously recorded overflying the Site (at West Site) in 2013 (information contained within an ecology report submitted with planning application DM/1027/13/ OUT) but there are no extensive areas of reedbed/marsh habitat that would be suitable nesting habitat; the reedbed habitat within the Site (at West Site) is restricted to narrow bands within/on the margins of the ditches. Breeding SPA/Ramsar species are therefore not considered further and are scoped out of the assessment.

Breeding Non-SPA/Ramsar Species

Desk Study

10.3.38 The Lincolnshire Environmental Records Centre (LERC) desk study returned a number of records of breeding species within the study area, including five

[13] Terrestrial surveys will be undertaken twice monthly across the High Water period between September 2022 and March 2023 inclusive.

species listed on Annex I of the EC Birds Directive, 13 species listed on Schedule 1 of the Wildlife and Countryside Act (1981) (as amended) (Ref 10-13), 15 Species of Principal Importance (SPI), and respectively 16 Red List and seven Amber List species included in the Birds of Conservation Concern 5 (BoCC5). The records also include 14 species of bird that are priority species in Lincolnshire listed on the Lincolnshire BAP.

10.3.39 Previous breeding bird surveys of the West Site in 2013 for planning application DM/1027/113/OUT recorded the following breeding species on the West Site:

a. Grassland habitat: ground nesting skylark (*Alauda arvensis*) and meadow pipit (*Anthus pratensis*).

b. Ditches: reed warbler (*Acrocephalus scirpaceus*), sedge warbler (Acrocephalus schoenobaenus) and reed bunting (Emberiza schoeniclus).

c. Boundary hedgerows: blackcap (Sylvia atricapilla), chiffchaff (*Phylloscopus collybita*), willow warbler (*Phylloscopus trochilus*), whitethroat (*Sylvia communis*), lesser whitethroat (*Sylvia curruca*), tree sparrow (*Passer montanus*), yellowhammer (*Emberiza citrinella*), linnet (*Carduelis cannabina*) and song thrush (*Turdus philomelos*).

Breeding Bird Survey Method

10.3.40 The Common Bird Census (CBC) methodology was scaled down to five visits during the 2022 breeding bird season; this was considered adequate to provide a good indication of the breeding bird ornithological baseline for the purposes of an assessment of ornithological impacts.

10.3.41 The surveys involved recording all the birds observed, their locations and activity/behaviour. Contacts with birds (by song, call or sighting) were marked on the survey map using BTO species codes and standard behaviour notation[14].

10.3.42 Surveys were undertaken during the mornings in suitable weather conditions (unrestricted visibility, winds less than Beaufort 5 and not in continuous rain). Surveys of the land off Kings Road were undertaken on 17 March, 11 April, 05 and 25 May and 21 June 2022 to record breeding activity within this part of the Site, which was the only accessible area for survey in Spring 2022. Further survey work is necessary to characterise the breeding bird assemblage within Long Strip woodland and the Queens Road part of the site and will be undertaken in spring/summer 2023.

10.3.43 The survey maps were analysed to determine breeding activity for species of conservation concern and/or protected species according to the following categories:

a. Possible breeding – species present during the survey period in possible nesting habitat, but with no indication of breeding. Presumed passage migrants are not included.

[14] https://www.bto.org/sites/default/files/u10/downloads/taking-part/species_codes.pdf) (Ref 10-38)

b. Probable breeding – observations of one or more of the following activities during the survey period:
   i. singing male heard, or breeding calls heard.
   ii. pair observed in suitable nesting habitat during the survey period.
   iii. display or courtship.
   iv. birds visiting a probable nest site.
   v. birds seen to be carrying nesting material.
c. Confirmed breeding – observations of any one or more of the following activities during the survey period:
   i. agitated behaviour or anxiety calls from adults suggesting a nest or young close by.
   ii. distraction display or injury feigning from adults.
   iii. a nest has obviously been used or eggshells found.
   iv. adults seen carrying food for young.
   v. adults seen carrying faecal sac away from nest site.
   vi. nest with eggs.
   vii. nest with young or downy young in the case of waders, game birds etc.
   viii. recently fledged young.
   ix. soliciting calls from young birds.
d. Non-breeding – species present during the survey period however the habitat type within the survey area is unsuitable for the particular species (for example passage migrants).

Breeding Bird Survey Results

10.3.44 A detailed breeding bird report will be prepared as a technical appendix to the ornithology chapter of the ES, but the results of the surveys undertaken to date are summarised below. The assemblage recorded is similar to that recorded on the West Site area during previous surveys in 2013 (information contained within an ecology report submitted with planning application DM/1027/13/OUT).

Table 10.9: Summary of Breeding Birds Recorded in Land off Kings Road

English Name	Scientific Name	Birds of Conservation Concern 5 (BOCC5)	Annex 1 of the EU Birds Directive (Annex 1)	Schedule 1 Wildlife and Countryside Act 1981 (Schedule 1)	UK Biodiversity Action Plan Priority Species (UK BAP)	NERC Act 2006	Breeding Status (Confirmed, Probable, Possible or Not Breeding)	Territories/breeding pairs within West Site area
Pheasant	*Phasianus colchicus*						Probable	1
Woodpigeon	*Columba palumbus*	Amber					Probable	2
Blue Tit	*Cyanistes caeruleus*						Possible	1
Great Tit	*Parus major*						Possible	1
Skylark	*Alauda arvensis*	Red			✓	s.41 species	Probable	1
Cetti's Warbler	*Cettia cetti*			✓			Probable	1
Long-tailed Tit	*Aegithalos caudatus*						Probable	1
Willow Warbler	*Phylloscopus trochilus*	Amber					Probable	1

English Name	Scientific Name	Birds of Conservation Concern 5 (BOCC5)	Annex 1 of the EU Birds Directive (Annex 1)	Schedule 1 Wildlife and Countryside Act 1981 (Schedule 1)	UK Biodiversity Action Plan Priority Species (UK BAP)	NERC Act 2006	Breeding Status (Confirmed, Probable, Possible or Not Breeding)	Territories/breeding pairs within West Site area
Chiffchaff	*Phylloscopus collybita*						Probable	1
Sedge Warbler	*Acrocephalus schoenobaenus*	Amber					Probable	3
Reed Warbler	*Acrocephalus scirpaceus*						Probable	2
Blackcap	*Sylvia atricapilla*						Possible	1
Whitethroat	*Sylvia communis*						Probable	3
Wren	*Troglodytes troglodytes*	Amber					Probable	4
Blackbird	*Turdus merula*						Probable	1
Song Thrush	*Turdus philomelos*	Amber			✓	s.41 species	Probable	1
Robin	*Erithacus rubecula*						Probable	1
Meadow Pipit	*Anthus pratensis*	Amber					Probable	1

English Name	Scientific Name	Birds of Conservation Concern 5 (BOCC5)	Annex 1 of the EU Birds Directive (Annex 1)	Schedule 1 Wildlife and Countryside Act 1981 (Schedule 1)	UK Biodiversity Action Plan Priority Species (UK BAP)	NERC Act 2006	Breeding Status (Confirmed, Probable, Possible or Not Breeding)	Territories/breeding pairs within West Site area
Chaffinch	*Fringilla coelebs*						Probable	1
Linnet	*Linaria cannabina*	Red			✓	s.41 species	Probable	1
Goldfinch	*Carduelis carduelis*						Probable	1
Reed Bunting	*Emberiza schoeniclus*	Amber			✓	s.41 species	Probable	3
Magpie	*Pica pica*						Not breeding	
Carrion crow	*Corvus corone*						Not breeding	
Dunnock	*Prunella modularis*	Amber			✓	s.41 species	Not breeding	
Yellowhammer	*Emberiza citrinella*	Red			✓	s.41 species	Not breeding	

10.3.45 One probable breeding pair of the Annex I species Cetti's warbler was recorded within the West Site area. Cetti's warbler, a previously rare UK species restricted to the southern region, has rapidly expanded its breeding range north and is now referred to in the Lincolnshire Bird Atlas as an "…*increasing breeding resident and passage migrant/winter visitor in Lincolnshire*."[15] Cetti's warbler has also been recently (in 2019) taken out of the UK Rare Breeding Birds Panel annual reports, reflecting its substantial increases in breeding numbers and range across the country. The south bank of the Humber was reported to support 93 singing males at the time of the 2021 Lincolnshire Bird Atlas publication, and it is therefore concluded to be relatively widespread in suitable habitats along the south bank of the Humber in North East/North Lincolnshire.

10.3.46 Two Red List species of high conservation concern were recorded probably breeding, with one pair each of skylark and linnet recorded within the West Site area. There were seven Amber List species of moderate conservation concern recorded as probably breeding within the Site, with sedge warbler and reed bunting being present on several of the overgrown ditches within the Site where there was an abundance of common reed to provide nesting sites for these species.

10.3.47 A total of 22 possible/probable breeding species were recorded within the West Site. Based on the criteria published by Fuller[16], this assemblage would fall beneath the 'Local' significance band of 25 to 49 breeding species. As no rare or notable species were recorded, it is therefore concluded that the breeding bird assemblage is of Site value to nature conservation.

10.3.48 Land off Queens Road and Long Strip woodland would be expected to support a range of breeding bird species commonly found within woodland habitats, and may be reasonably concluded to be of Site or Local value to nature conservation following the completion of surveys within the habitat.

Future Baseline

10.3.49 In the absence of the Project, the current marine coastal processes would remain the same as described in **Chapter 16: Physical Processes**.

10.3.50 Marine species are likely to become increasingly vulnerable to anthropogenic pressures in the future due to the predicted effects of climate change and ocean acidification in combination with more local pressures. The 2020 MCCIP report card (Ref 10-40) highlighted the following changes to ecology receptors could potentially occur as a result of climate change:

a. Sea-level rise could result in deeper waters and larger waves reaching saltmarsh and other intertidal habitats, causing erosion at the seaward edge;

b. Changes in patterns of rainfall or temperature changing vegetation composition of coastal saltmarsh communities;

[15] Casey, C., Clarkson, J.R., Espin, P. and Hyde, P.A. (2021) *Birds of Lincolnshire*. Published by the Lincolnshire Bird Club. Ref 10-39.
[16] Fuller, R.J. (1980) *A method for assessing the ornithological interest of sites for nature conservation*. British Trust for Ornithology, Hertfordshire, UK. (Ref 10-41).

c. Marine communities around the UK altering as ocean acidification increases;

d. Changing sea temperatures resulting in range shifts for both benthic species and mobile species (such as fish, marine mammals). This could result in a decline of some cold-water species around certain parts of the UK and an increase in the prevalence of non-native species;

e. Changing temperatures affecting spawning in some marine species as well as the timings of migrations;

f. Coastal waterbirds showing north-easterly shifts in the winter distributions in Europe; and

g. Changes in prey distribution and availability, resulting in range shifts in some regional populations of marine mammals, fish and seabirds.

10.3.51 Data suggests that ecological changes linked to climate change (such as range shifts) are already occurring although there is currently a high degree of uncertainty with respect to predicting the magnitude of potential effects in the future.

10.4 Development Design and Impact Avoidance

Standard Mitigation Measures

Impacts on Nesting Birds (construction)

10.4.1 Vegetation clearance will be undertaken outside the nesting bird season where possible, and clearance works will be avoided in the period March to August inclusive to ensure compliance with the Wildlife and Countryside Act (1981) (as amended) (Ref 10-13).

10.4.2 Where this is not possible, pre-clearance checks of vegetation would be undertaken to identify any nesting species. If occupied nests are identified, an appropriate buffer zone (at least 2 m) would be established around the nest to ensure it is protected from damage/ destruction during construction. No clearance of vegetation within the buffer zone would be undertaken until any young had fledged and the nest was confirmed to be unoccupied.

10.5 Potential Impacts and Effects

10.5.1 The preliminary assessment has identified the potential likely effects on ornithology receptors as a result of the construction and subsequent operation of the Project.

10.5.2 The Physical Processes assessment (**Chapter 16: Physical Processes** and Water and Sediment Quality assessment (**Chapter 17: Marine Water and Sediment Quality**) have informed the outcomes of the ornithology assessment.

10.5.3 Potential impacts on features of internationally designated sites (SACs, SPAs and Ramsar sites) have been assessed in **Section 10.5** and will also be assessed within the HRA (**Appendix 9.C** (PEI Report, Volume IV))

10.5.4 It is noted that the Killingholme Haven Pits Site SSSI which is located approximately 6km away from the Project could be functionally linked to the

mudflat habitat in the Project footprint with local populations of species such as Dunlin and Black-tailed Godwit potentially utilising both areas. However, Killingholme Haven Pits is considered too distant to be impacted directly by the Project (such as through potential disturbance effects). Based on the predicted magnitude of potential effects and proposed mitigation, indirect impacts on the SSSI (e.g., changes in local population levels resulting from changes in distribution or mortality) are also expected to be negligible.

10.5.5 The Lagoons SSSI is located approximately 20km from the Project with Little Tern a notified feature of the SSSI. However, data suggests that this species forages within 5km of nesting sites (Ref 10-34) with this species considered very rare within the Immingham area. On this basis, this notified feature will not overlap with any potential direct or indirect changes resulting from the construction and operational activities associated with the Project which are limited to within the vicinity of the Port of Immingham.

10.5.6 Cumulative impacts on ornithology receptors that could arise as a result of other coastal and marine developments and activities in the Humber Estuary combined with the project are considered as necessary and is assessed as part of **Chapter 25: Cumulative Effects and In-Combination Effects**.

Construction

10.5.7 This section contains a preliminary assessment of the potential impacts to ornithology receptors as a result of the construction phase of the Project. Potential effects during the construction phase that are considered relevant are reviewed in **Table 10.10**. It should be noted that the table includes the rationale for the scoping in or out of individual pathways for further assessment in this PEI Report.

10.5.8 The construction of the Project may be completed in a single stage, or it may be sequenced such that the construction of Berth 2 takes place at the same time as operation of Berth 1 (see **Chapter 2: The Project**). In the case of a sequenced construction, the duration of construction will be extended with both construction and operational disturbance stimuli potentially occurring concurrently. However, both berths will be over 1 km offshore and therefore no disturbance responses in roosting and feeding waterbirds utilising nearby intertidal habitat are expected to occur due to Berth 2 construction (with the approach jetty which directly overlaps with the intertidal already constructed for Berth 1). Potential disturbance in operation is expected to be relatively limited given the nature of the activities and expected habituation. Therefore, the assessment below is considered the worst case and will not be altered by a sequenced construction period.

Table 10.10: Potential effects during construction scoped in / out of further detailed assessment

Impact Pathways/ Potential Effects	Project activity	Included in assessment?	Justification
Direct loss to intertidal feeding and roosting habitat as a result of the piles	Piling	Yes	Piling would result in the small loss of intertidal habitat. This impact pathway has, therefore, been scoped into the assessment.
Direct changes to waterbird foraging habitat as a result of the capital dredge and dredge disposal	Capital dredge and dredge disposal	No	The footprint of the capital dredge and dredge disposal sites do not overlap with the intertidal and would not cause any direct changes to intertidal feeding and roosting habitat. Capital dredging and dredge disposal at sea has the potential to cause impacts to seabed habitats which could cause changes to the prey resources available for seabirds and other diving birds. However, the seabed in the vicinity of the berth pockets and at the disposal sites are highly dynamic and subject to regular physical disturbance as a result of maintenance dredging and strong tidal currents. These areas are likely to provide a limited prey resource and are also not known to support large populations of diving birds/seabirds. This impact pathway has, therefore, been scoped out of the assessment.
Indirect changes to foraging and roosting habitat as a result of changes to hydrodynamic and sedimentary processes	Marine works (capital dredging and piles)	Yes	The capital dredge and piling structures 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) which could cause changes to intertidal feeding and roosting habitat. This impact pathway has, therefore, been scoped into the assessment.
	Dredge disposal	No	Dredge disposal 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). The seabed in the vicinity of the disposal sites are highly dynamic and

Impact Pathways/ Potential Effects	Project activity	Included in assessment?	Justification
			subject to regular physical disturbance as a result of maintenance dredging and strong tidal currents. As described in more detail in **Chapter 16: Physical Processes**, only minor changes in flow rates and subtidal seabed morphology are predicted which are not expected to modify existing subtidal habitat types found in the area (i.e. mobile sand habitats characterised by an impoverished infaunal assemblage). On this basis, these areas are likely to provide a limited prey resource and are also not known to support large populations of diving birds/seabirds. This impact pathway has, therefore, been scoped out of the assessment.
Changes to seabed habitats and species as a result of sediment deposition during piling	Piling	No	Piling has the potential to result in the localised resuspension of sediment as a result of seabed disturbance. The amount of 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 has, therefore, been scoped out of the assessment for coastal waterbirds in terms of changes to supporting habitat and prey resources
Direct loss of terrestrial habitats that are functionally linked to the Humber Estuary SPA/ Ramsar	Construction	Yes	Large arable field within temporary construction area off Laporte Road may be suitable for high tide feeding, roosting and loafing waterbirds. This impact pathway is considered in more detail below. No other terrestrial habitats within the Site boundary are suitable for coastal waterbirds.
Direct loss of breeding bird (SPA/ Ramsar) habitats	Construction	No	No suitable habitats for breeding SPA/Ramsar species are present within the Site. This impact pathway has, therefore, been scoped out of the assessment

Impact Pathways/ Potential Effects	Project activity	Included in assessment?	Justification
Direct loss of breeding bird (non-SPA/ Ramsar) habitats	Construction	Yes	The breeding bird assemblage on the Land off Kings Road part of the Site is evaluated to be of Site nature conservation importance and is therefore not scoped in as a relevant ecological feature for the purposes of impact assessment. The woodland habitat within Land off Queens Road/Long Strip has not yet been surveyed, although given the relatively low diversity of the woodland habitats, and thus the limited nature of the habitats for nesting species, it is not anticipated that the woodland would support a particularly important assemblage of nesting birds. However, the precautionary principle has been applied for the PEI Report and this feature is scoped into the impact assessment.
Airborne noise and visual disturbance to coastal waterbirds using intertidal habitats	Construction	Yes	During construction, there is the potential for airborne noise and visual disturbance to affect coastal waterbirds. This impact pathway is considered in more detail below.
Airborne noise and visual disturbance to coastal waterbirds using functionally linked terrestrial habitats outside the boundary of the Humber Estuary SPA/ Ramsar	Construction	Yes	During construction, there is the potential for airborne noise and visual disturbance to affect coastal waterbirds using functionally linked land. This impact pathway is considered in more detail below.
Noise and visual disturbance during capital dredge disposal	Capital dredge and dredge disposal	No	During dredge disposal, there is the potential for the dredging vessel to cause noise and visual disturbance. However, only a very small increase in vessel movements in the vicinity of the disposal site due to the capital dredge activity will occur. In addition, these areas are also not known to support large populations of diving birds/seabirds. Research has shown that disturbance to birds from vessel movements generally occurs within 50 to 100 m with vessels

Impact Pathways/ Potential Effects	Project activity	Included in assessment?	Justification
			approaching at faster speeds eliciting higher disturbance (Ref 10-42; Ref 10-43; Ref 10-44). However, it is acknowledged that some species such as Red-throated Diver and Common Scoter are considered particularly sensitive to disturbance from vessels and could be disturbed at greater distances (Ref 10-44; Ref 10-45; Ref 10-46; Ref 10-47. Any potential disturbance stimuli caused by the capital dredge disposal would be restricted to a localised area in the vicinity of the vessel for most species with even sensitive species (such as as Common Scoter) expected to temporarily redistributed locally, rather than dispersing out of the area. In addition, vessels will only be at the disposal sites for short durations of time with any birds that might be temporarily flushed able to return to feeding following cessation of the capital dredge disposal activity. In addition, the foraging ranges of diving bird species encompasses an extensive area which will not be spatially restricted to the disposal sites which are not considered to be important foraging areas for diving bird species. In addition, it should be noted that due to the high levels of existing maintenance dredging activities within the area, seabirds and other diving birds foraging in the dredge footprint would be expected to be reasonably habituated to vessels with more sensitive species already likely to be avoiding this area. This impact pathway has, therefore, been scoped out of the assessment.

10.5.9 This section contains a preliminary assessment of the potential impacts to coastal waterbird receptors as a result of the construction phase of the Project. The following impact pathways have been assessed:

a. Direct loss to intertidal feeding and roosting habitat as a result of the piles;

b. Direct loss of terrestrial habitat that are functionally linked to the Humber Estuary SPA/Ramsar;

c. Direct loss of breeding habitat used by non-SPA/ Ramsar birds;

d. Indirect changes to intertidal foraging and roosting habitat as a result of changes to hydrodynamic and sedimentary processes; and

e. Airborne noise and visual disturbance to coastal waterbirds using intertidal habitats and functionally linked terrestrial habitats outside the boundary of the Humber Estuary SPA/ Ramsar Site.

Direct loss to intertidal feeding and roosting habitat as a result of the piles

10.5.10 The piles will cause a direct loss of 0.017 ha of intertidal mudflat habitat.

10.5.11 The loss of habitat represents approximately 0.000046 % of the Humber Estuary SPA/Ramsar[17]. When considering this in the context of intertidal, the area of loss represents approximately 0.000196 % of intertidal foreshore habitats[18] and approximately 0.000274 % of mudflat[19] within the SPA/Ramsar.

10.5.12 This habitat loss is therefore clearly negligible in the context of the Humber SPA and Ramsar.

10.5.13 The loss of habitat due to piling will also be highly localised and considered de minimis in extent. The loss is also considered to be 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.

10.5.14 On this basis, any change to prey resources for birds feeding in the local area will be negligible. 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.

10.5.15 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

[17] Based on the extents given in the Standard Data Form on the JNCC website (Ref 10-25)
[18]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 (Ref 10-48)
[19] 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). (Ref 10-49).

Indirect changes to intertidal foraging and roosting habitat as a result of changes to hydrodynamic and sedimentary processes

10.5.16 Numerical modelling has been carried out to investigate the extent of changes to intertidal habitat from the marine works (capital dredge and piling) and is presented in detail in **Chapter 16: Physical processes**. 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.

10.5.17 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. This will result in a potential indirect loss in 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).

10.5.18 This loss represents 0.000027 % of the Humber Estuary SPA/Ramsar[20]. When considering this in the context of intertidal area, the area of loss represents approximately 0.000113 % of intertidal foreshore habitats[21] and approximately 0.000157 % of mudflat[22] within the SPA.

10.5.19 The predicted intertidal loss also consists of a very narrow strip on the lower shore around the sublittoral fringe and is considered to have limited functional value to waterbirds which utilise the foreshore in this location (such as Black-tailed Godwit, Turnstone, Curlew, Dunlin, Oystercatcher, Redshank, Knot and Shelduck) (**Table 10.7**).

10.5.20 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**

Direct loss of terrestrial habitats that are functionally linked to the Humber Estuary SPA/ Ramsar

10.5.21 At present there is no survey data to inform an evaluation of whether the arable land within the temporary construction compound off Laporte Road is functionally linked to the Humber Estuary SPA/Ramsar. However, given the proximity of the land to the intertidal feeding habitats, and that the land use would render it

[20] Based on the extents given in the Standard Data Form on the JNCC website (JNCC, 2022b)
[21] 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
[22] 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).

suitable for high tide roosting, feeding and loafing waterbirds across the high tide period, a precautionary approach has been taken to the preliminary assessment.

10.5.22 The construction phase of the Project would result in the temporary displacement of waterbirds from this habitat for the duration of construction, although the land would not be permanently lost.

10.5.23 In the absence of mitigation, there is the potential for the loss of functionally linked land during construction to result in an adverse effect on high tide roosting, loafing and feeding SPA/Ramsar waterbirds, which may be significant in the context of the Estuary populations depending on the numbers of species, and the regularity with which they are present (i.e. how seasonally important the land is to wintering/ passage waterbirds).

Direct loss of breeding bird (non-SPA/ Ramsar) habitats

10.5.24 The loss of woodland within Long Strip may will result in an adverse effect on breeding birds, due to the permanent nature of the habitat impacts and thus the permanent displacement of nesting pairs. However, the magnitude of the impact and the significance of the effect cannot be determined until further survey work has been undertaken, and the extent of woodland loss quantified.

10.5.25 At this stage it is assumed, based on the relatively limited diversity of the woodland, that any breeding bird assemblage would be reasonably likely to be evaluated to be of Site or Local value to nature conservation. Therefore applying the precautionary principle, it is assessed that the permanent loss of breeding bird territories within the woodland is likely to result in a moderate adverse effect, that would be **significant** (Site or Local level).

Airborne noise and visual disturbance to coastal waterbirds using intertidal habitats

10.5.26 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 (Ref 10-50; Ref 10-51; Ref 10-52; Ref 10-53; Ref 10-54).

10.5.27 High level responses to noise (such as dispersal away from marine works) are typically associated with sudden noise over 60 dB (at the receiver (i.e. bird) location not the noise source) or irregular noise over 70 dB (Ref 10-55). However, visual disturbance associated with construction activity will often create a disturbance effect before any associated noise starts to have an effect particularly in those species sensitive to visual stimuli (Ref 10-55). It should be noted that the predicted noise levels associated with piling and other construction activities were not available in time for the PEI Report but will be included in the ES.

10.5.28 The specific responses that waterbirds will have to disturbance varies between species with some ducks (such as Shelduck) and larger waders such as Curlew, Grey Plover and godwits generally showing stronger responses to disturbance

stimuli than smaller waders (such as Turnstone, Dunlin and Sanderling) (Ref 10-56; Ref 10-57; Ref 10-58; Ref 10-55; Ref 10-57). The level of response to potential disturbance stimuli also varies considerably between birds of the same species. This is due to their previous experience of the 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 (Ref 10-60; Ref 10-61; Ref 10-62; Ref 10-56. Evidence suggests, however, that waterbirds generally show a flight response to construction activities and a presence of people (such as construction workers) on or near the foreshore at distances <200-300 m (and more typically between 20 m and 100 m for certain species such as Turnstone or Dunlin) (Ref 10-63; Ref 10-64; Ref 10-62; Ref 10-65; Ref 10-66; Ref 10-67; Ref 10-55; Ref 10-68; Ref 10-57; Ref 10-56; Ref 10-59; Ref 10-51). However, distances over 300 m have been recorded more occasionally for some sensitive species (Ref 10-55; Ref 10-56; Ref 10-59; Ref 10-57). A 300 m radius, however, is often commonly applied to construction works based on a broadly worst-case FID range for sensitive waterbirds (Ref 10-69).

10.5.29 The bird data suggest that the foreshore fronting the Project (i.e. the section of Sector C between the IOT Jetty and the mudflat fronting North Beck drain within approximately 400-500 m of the Project) is regularly used by a variety of feeding and roosting waterbirds including flocks of Black-tailed Godwit (typically < 100 birds), Turnstone, Curlew, Dunlin (typically <50-60 birds) as well as lower numbers of other species such as Oystercatcher, Redshank and Shelduck (<20 birds).

10.5.30 It should be noted that construction of the Jetty Platform will occur at distances of more than 1km from the foreshore. In addition, capital dredging of the berths will also be undertaken at distances of more than 1km from the foreshore. On this basis, responses are considered unlikely even in more sensitive species and these elements of construction are not considered further.

10.5.31 The approach jetty construction works will overlap directly with the foreshore. 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 the construction of the approach jetty.

10.5.32 The evidence reviewed above suggests that the response of waterbirds to disturbance stimuli is relatively limited at distances over 200-300m, particularly in areas subject to already high levels of existing anthropogenic activity (as found in the Port of Immingham area). On this basis while disturbance responses of waterbirds would be expected associated with approach jetty construction activity on or near the foreshore, the more offshore elements of the approach jetty at distances greater than 200m to 300m would be expected to cause limited responses in birds.

10.5.33 Waterbirds present in the area are expected to be habituated to some extent to anthropogenic activities (due to existing port operations) near the foreshore. Nevertheless, construction of the approach jetty is located in close proximity to

feeding and roosting habitats used by waterbirds. 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. 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. It is acknowledged, however, that wintering waterbirds can show a high level of site fidelity and 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) (Ref 10-31 Ref 10-70; Ref 10-71; Ref 10-72).

10.5.34 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as potentially **significant**.

Operation

10.5.35 This section contains a preliminary assessment of the potential impacts to ornithology receptors as a result of the operational phase of the Project. These effects have been reviewed in **Table 10.11.** This section includes an explanation of the rationale that was adopted for scoping in or out individual pathways for further assessment.

Table 10.11: Potential effects during operation scoped in / out of further detailed assessment

Receptor	Impact Pathways/Potential Effects	Project activity	Included in more detailed assessment?	Justification
Coastal waterbirds	Direct changes to intertidal foraging and roosting habitat as a result of marine infrastructure	Berth operations	Yes	Marine infrastructure associated with the Project (such as the raised jetty structure) could potentially cause direct damage or reduced functionality to waterbird feeding and roosting habitat. 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 rather than the direct loss of intertidal mudflat habitat due to the infrastructure (i.e. the piles) which would be assessed in the construction phase. 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 the disturbance pathway below. However, it is acknowledged that such effects are likely to be interrelated to some extent. This impact pathway is considered in more detail below.
	Airborne noise and visual disturbance to coastal waterbirds using intertidal habitats	Berth operations	Yes	During operation, there is the potential for airborne noise and visual disturbance to affect coastal waterbirds. This impact pathway has, therefore, been scoped into the assessment.
	Airborne noise and visual disturbance to waterbirds using terrestrial habitats	Berth operations	Yes	During operation, there is the potential for airborne noise and visual disturbance to affect coastal waterbirds using terrestrial land adjacent to the Humber Estuary. This impact pathway has, therefore, been scoped into the assessment.

10.5.36 This section contains a preliminary assessment of the potential impacts to coastal waterbird receptors as a result of the operational phase of the Project. The following impact pathways have been assessed:

a. Direct changes to intertidal foraging and roosting habitat as a result of the presence of the infrastructure;

b. Airborne noise and visual disturbance to coastal waterbirds using intertidal habitats; and

c. Airborne noise and visual disturbance to coastal waterbirds using terrestrial habitats.

Direct changes to intertidal foraging and roosting habitat as a result of the presence of infrastructure

10.5.37 For clarity it should be noted this pathway relates to potential changes to foraging and roosting habitat as a result of the physical presence of marine infrastructure. The direct loss of intertidal mudflat habitat due to the presence of the infrastructure (i.e. the piles) was assessed in the construction phase (**Paragraph 10.5.10**).

10.5.38 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 the disturbance pathway below. However, it is acknowledged that such effects are likely to be interrelated to some extent.

10.5.39 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) (Ref 10-73, 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 (assessed below) (Ref 10-74).

10.5.40 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 (Ref 10-75).

10.5.41 Marine infrastructure associated with the Project (raised jetty structure, linkspan etc.), will not prevent any direct access to established roosting habitat used by coastal waterbirds in the area. In addition, shading caused by the structures would not be expected to cause significant changes to benthic prey resources used by coastal waterbirds as assessed above.

10.5.42 The approach jetty will be an open piled structure with large gaps between each of the piles and between the jetty deck and the foreshore seabed (i.e. the mudflat surface). 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 1km from the Project) and the Immingham Oil Terminal approach jetty (approximately 500m from the Project) – 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 closely. On this basis, birds would be expected to show similar highly localised responses to structures associated with the Project 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.

10.5.43 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant.**

Airborne noise and visual disturbance to coastal waterbirds using intertidal habitats

10.5.44 Operational ports, wherever located, inevitably act as a potential source of disturbance in the coastal environment. Waterbird monitoring work in the vicinity of port locations 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) (Ref 10-76; Ref 10-51). For example, Ref 10-69 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.

10.5.45 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

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

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.

10.5.46 Operational disturbance stimuli could occur as a result of vessel movements associated with the Project. However, the nearest berth during spring tide periods will be located approximately 1km from intertidal mudflat used by coastal waterbirds. On this basis, disturbance responses are considered highly unlikely due to vessel movements and berthing operations.

10.5.47 Disturbance could potentially occur as a result of vehicles on the approach jetty near the intertidal. The movement of vehicles will typically be restricted to periods of vessel mooring and disembarkation. This will include movement along the approach jetty which will be located above the intertidal mudflats. In general, human presence on the foreshore (e.g. walking) is considered to cause greater disturbance than vehicles (Ref 10-52; Ref 10-53; Ref 10-62). 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 (Ref 10-69). 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) (Ref 10-77; Ref 10-78; Ref 10-69).

10.5.48 Vehicle movements associated with the Project will be spatially limited and mostly restricted to linear routes (e.g. along the jetty) with no direct access to the foreshore. Vehicle movement will 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 (**Section 10.3**). Furthermore, pipe racks on either side of the approach jetty (which are approximately 2m in height) will likely obscure the visibility that birds on the foreshore have to moving vehicles on the approach jetty and act as screens to some extent.

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

10.5.50 The level of response that waterbirds will have to operations 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. 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.

10.5.51 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 vessel movements will be occurring close to the foreshore 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 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.

10.5.52 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Airborne noise and visual disturbance to coastal waterbirds using terrestrial habitats

10.5.53 Following the completion of construction, the temporary compound occupying the arable land off Laporte Road would be removed and it is assumed that it would be reverted to its previous agricultural use. It would therefore return to being suitable habitat for high tide feeding, roosting and loafing waterbirds, and may be considered functionally linked to the Humber Estuary when the Project is operational, if it supported waterbirds in aggregations >1% of the Humber Estuary 5-year peak mean. In this case, there is the potential for noise and visual disturbance arising from the operation of the Project to result in the disturbance/displacement of birds from this habitat.

10.5.54 As discussed above in respect of the potential for noise and visual disturbance to waterbirds on the intertidal habitats, waterbirds are already relatively habituated to normal day-to-day port operations such as vessel and vehicle movements associated with the foreshore/ intertidal area.

10.5.55 Operational activities associated with the jetty (vehicle/people movements) would be closer to the field than existing operations associated with the IOH jetty, but would be relatively well screened from any waterbirds within the field by retained woodland in Long Strip (which is adjacent to the western boundary of the field) and the raised flood embankment (around the north and east boundaries of the field). There is a public footpath running the length of the northern boundary of the field (on top of the flood embankment), and therefore any waterbirds using the field would be assumed to be tolerant of people/ vehicles (the path is used by the Environment Agency when undertaking maintenance works) on the flood embankment. There is also a public bridleway running along the eastern edge of the woodland, although this is screened to some degree from the field by the mature field boundary hedgerow; however, as stated above, it is reasonable to

assume that any waterbirds using the field are tolerant of existing recreational activity (or already modify their behaviour as a result).

10.5.56 It is therefore concluded that, even in the absence of evidence to demonstrate that the arable field is functionally linked to the Humber Estuary, if a precautionary approach is taken to the assessment, there would be a minor adverse effect arising from noise/visual disturbance during operation, that is **not significant**.

10.6 Mitigation and Enhancement Measures

Disturbance to coastal waterbirds during construction

10.6.1 In order to reduce the level of potential impact associated with noise and visual disturbance during construction, a number of mitigation measures are being considered including the use of soft start procedures, cold weather construction restrictions, seasonal working restrictions and the use of acoustic barriers and screening.

10.6.2 These mitigation measures would be further developed if required through ongoing engagement with statutory authorities as part of the statutory consultation process and taking into account the final Project design information and latest understanding of potential effects.

Loss of functionally linked land (construction)

10.6.3 It may be necessary to mitigate for the loss of the arable land within the temporary construction compound off Laporte Road if it is concluded to be functionally linked to the Humber Estuary.

10.6.4 The land lies within the Mitigation Zone to which Policy 9 of the Local Plan is applicable. This states that "…*proposals which adversely affect the Humber Estuary SPA/ Ramsar site due to the loss of functionally linked land will normally be required to provide their own mitigation in order to comply with the requirements of the Habitats Regulations*."

10.6.5 To ensure Habitats Regulations compliance for the Project, if the land is subsequently concluded to be functionally linked to the Humber Estuary SPA/ Ramsar, Policy 9 could be applied to the Project as embedded mitigation for the loss of land, and a payment made to contribute towards the South Humber Bank Strategic Mitigation Delivery Plan.

10.6.6 However, given that the land will only be lost temporarily for the duration of construction, the potential for alternative mitigation could be considered. Policy 9 states that "*On an exceptional basis independent alternative mitigation proposals will be considered on sites within the identified Mitigation Zone. Proposals should be supported by evidence that demonstrates that the alternative mitigation contributes to the overall mitigation strategy and ensures that the development avoids adverse effects on the integrity of the SPA/Ramsar site, alone or in combination*." Where proposed by the Applicant, further discussion with stakeholders would be undertaken as necessary.

Loss of breeding bird habitat within Long Strip woodland (construction)

10.6.7 As set out in Chapter 8 (Terrestrial Ecology), a compensation strategy for the loss of woodland (a UK Priority Habitat) will need to be agreed with the local planning authority to ensure compliance with Local Planning Policy 41, which states that the council will seek to "..*minimise the loss of biodiversity features, or where loss is unavoidable and justified ensure appropriate mitigation and compensation measures are provided..".*

10.6.8 Mitigation for loss of breeding bird habitats will be determined following the completion of further survey work in spring 2023 to identify the species present, and to evaluate the importance of the woodland to breeding birds.

10.7 Preliminary Assessment of Residual Effects

Construction

10.7.1 The following sections summarise the likely effects on ornithology receptors. Potential effects on the following receptors during construction were assessed as potentially significant:

a. Noise and visual disturbance on intertidal feeding and roosting during construction;

b. Loss of functionally linked land during construction; and

c. Loss of woodland supporting breeding non-SPA/ Ramsar birds.

10.7.2 Standard mitigation measures for noise/ visual disturbance including the use of soft start procedures, cold weather construction restrictions, seasonal working restrictions and the use of acoustic barriers and screening will be developed if required through ongoing engagement with statutory authorities.

10.7.3 The loss of functionally linked land would be mitigated either through a financial contribution to the South Humber Bank Strategic Mitigation Delivery Plan as set out in Policy 9 of the North East Local Plan, or an alternative mitigation strategy to be agreed with stakeholders.

10.7.4 With the implementation of appropriate mitigation measures, the residual effects on these receptors are considered likely to be **not significant** at this preliminary stage.

10.7.5 The permanent loss of woodland of this age and structure providing habitat for nesting birds could not be compensated over the short to medium term. Instead, compensation would require a timeframe longer than the proposed 25-year operational life of the terrestrial elements of the Project (excluding the jetty and jetty access road). So, the loss of breeding bird habitat would be permanent for the purposes of this assessment even with compensation. It is therefore assessed that the residual effect remains moderate adverse (**significant**).

10.7.6 All the other potential impacts on ornithology receptors have, at this preliminary stage, and based on the current project design, been assessed as **not significant**.

Operation

10.7.7 All potential impacts on ornithology receptors during operation have, at this preliminary stage, and based on the current project design, been assessed as **not significant**.

Decommissioning

10.7.8 The DCO Application would not make any provision for the decommissioning of the marine infrastructure above and below water level. This is because the development would, once constructed, become part of the fabric of the Immingham port estate and would, in simple terms, continue to be maintained so that it can be used for port related activities to meet a long-term need. On this basis, potential effects on ornithology receptors from decommissioning have been scoped out.

10.8 Summary of Preliminary Assessment

10.8.1 A summary of the impact pathways that have been assessed at this preliminary stage, together with the identified residual impacts and level of confidence is presented in **Table 10.10**.

Table 10.12: Summary of potential impact, mitigation measures and residual effects

Receptor	Impact pathway	Impact Significance	Mitigation Measure	Residual Effect	Confidence
Construction Phase					
Coastal waterbirds	Direct loss to intertidal feeding and roosting habitat as a result of the piles	Not significant	N/A	Not significant	Medium
	Direct loss of terrestrial habitats that are functionally linked to the Humber Estuary	Potentially significant	Contribution to South Humber Bank Strategic Mitigation Delivery Plan, or other alternative mitigation to be considered.	Not significant	High
	Indirect changes to intertidal foraging and roosting habitat as a result of changes to hydrodynamic and sedimentary processes	Not significant	N/A	Not significant	Low
	Airborne noise and visual disturbance to coastal waterbirds using intertidal habitats	Potentially significant	In order to reduce the level of potential impact associated with noise and visual disturbance during construction, a number of mitigation measures are being considered including the use of soft start procedures, cold weather construction restrictions, seasonal working restrictions and the use of acoustic barriers and screening.	Not significant	Medium

Receptor	Impact pathway	Impact Significance	Mitigation Measure	Residual Effect	Confidence
Breeding birds (non-SPA/ Ramsar)	Permanent loss of woodland habitat within Long Strip	Potentially significant	Compensation for loss of woodland to be agreed; like-for-like replacement would take longer to establish than the lifetime of this Project (which is anticipated to be 25 years for the operation of the terrestrial elements of the Project).	Potentially significant	Medium
Operational Phase					
Coastal waterbirds	Direct changes to foraging and roosting habitat as a result of the presence of infrastructure	Not significant	N/A	Not significant	Medium
	Airborne noise and visual disturbance to coastal waterbirds using intertidal habitats	Not significant	N/A	Not significant	Medium
	Airborne noise and visual disturbance to coastal waterbirds using terrestrial habitats	Not significant	N/A	Not significant	Medium

10.9 References

Ref 10-1 European Commission Office (2014). Environmental Impact Assessment (EIA) Regulations, the EIA Directive (2014/52/EU)

Ref 10-2 Institute of Environmental Management and Assessment (IEMA). (2017). Delivering Proportionate EIA

Ref 10-3 Chartered Institute of Ecology and Environmental Management (CIEEM). (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland. [Online] Available at: https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.1Update.pdf

Ref 10-4 European Commission (1992). Council Directive 92 /43 /EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

Ref 10-5 European Commission (2009). Council Directive 2009/147/EC of 30 November 2009 on the conservation of wild birds.

Ref 10-6 European Commission (2000). Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

Ref 10-7 The Stationery Office (2017a). Statutory Instrument 2017. No. 1012. The Conservation of Habitats and Species Regulations 2017.

Ref 10-8 The Stationery Office Limited (2019a). Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019.

Ref 10-9 The Stationery Office (2017b). Statutory Instrument 2017 No. 407. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.

Ref 10-10 The Stationery Office Limited (2009). Marine and Coastal Access Act 2009.

Ref 10-11 The Stationery Office Limited (2019b) The Floods and Water (Amendment etc.) (EU Exit) Regulations.

Ref 10-12 The Stationery Office (2008). Planning Act 2008.

Ref 10-13 The Stationery Office (1981). Wildlife and Countryside Act 1981.

Ref 10-14 The Stationery Office (2000). The Countryside and Rights of Way Act 2000.

Ref 10-15 The Stationery Office (2006). Natural Environment and Rural Communities Act 2006.

Ref 10-16 Department for Transport (2012). The National Planning Policy Statement for Ports.

Ref 10-17 The Stationery Office Limited (2011). UK Marine Policy Statement.

Ref 10-18 HM Government (2014). East Inshore and East Offshore Marine Plans.

Ref 10-19 North East Lincolnshire Council (2018). North East Lincolnshire Local Plan.

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10.10 Abbreviations and Glossary of Terms

Table 10.13: Glossary and Abbreviations

Term	Acronym	Definition
Appropriate Assessment	AA	The assessment of the impact on the integrity of a European site of a project or plan, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives.
Associated British Ports	ABP	One of the UK's leading and best-connected ports groups, owning and operating 21 ports and other transport-related businesses across England, Wales and Scotland.
Biodiversity Action Plan	BAP	A Biodiversity Action Plan is an internationally recognised program addressing threatened species and habitats and is designed to protect and restore biological systems.
Department for Business, Energy and Industrial Strategy	BEIS	The Government department responsible for policy and regulations on business, energy and industry issues.
Biodiversity Net Gain	BNG	An approach that aims to leave biodiversity within the natural environment in a measurably better state than its condition prior to implementation of a project.
British Trust for Ornithology	BTO	The British Trust for Ornithology is an organisation founded in 1932 for the study of birds in the British Isles.
Centre for Environment, Fisheries and Aquaculture Science	Cefas	The Centre for Environment, Fisheries and Aquaculture Science is an executive agency of the United Kingdom government Department for Environment, Food and Rural Affairs.
Chartered Institute of Ecology and Environmental Management	CIEEM	The leading professional membership body representing and supporting ecologists and environmental managers in the UK, Ireland and abroad.
Countryside and Rights of Way Act 2000	CRoW	The Countryside and Rights of Way Act gives greater freedom for people to explore open countryside as well as provisions designed to reform and improve rights of way in England and Wales. Additionally, the Act gives greater protection to wildlife and natural features by making provision for the conservation of biological diversity, and by improving protection for Sites of Special Scientific Interest in England and Wales and the enforcement of wildlife legislation as well as the introduction of provisions to allow the better management and protection of Areas of Outstanding Natural Beauty.

Term	Acronym	Definition
Diadromous species	D	Species using estuaries as pathways of migration (for reproduction) between fresh waters and the sea; migration from fresh water to sea water to breed (catadromous species, e.g. eel), and in the opposite direction (anadromous species, e.g., salmonids and lampreys)
Decibel	dB	The scale used to measure noise is the decibel scale which extends from 0 to 140 decibels, corresponding to the intensity of the sound pressure level.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Department of Energy and Climate Change	DECC	-
Department for Environment, Food and Rural Affairs	Defra	-
Department for Transport	DfT	The Department for Transport is the United Kingdom government department responsible for the English transport network.
European Commission	EC	An executive branch of the European Union.
Ecological Impact Assessment	EcIA	The process of identifying, quantifying and evaluating the potential impacts of defined actions on ecosystems or their components.
European Economic Community	EEC	-
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.
European Marine Site	EMS	European Marine Sites are areas at sea, partly or completely covered by tidal water, which are protected by European law.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
Estuarine resident Species	ES	Species that are able to reproduce and complete their life cycle in the estuary; as such they are highly euryhaline species, able to move throughout the full length of the estuary
European Union	EU	An economic and political union of 28 countries which operates an internal (or single) market which allows the

Term	Acronym	Definition
		free movement of goods, capital, services and people between member states.
Freshwater species	F	Species of freshwater origin that regularly or accidentally enter estuaries, in moderate to low numbers, moving varying distances down the estuary but often restricted to low-salinity, upper reaches of estuaries and to periods of freshwater flooding
Feature of Conservation Importance	FOCI	Features of Conservation Importance are marine features that are particularly threatened, rare, or declining species and habitats.
Great Britain	GB	-
Humber International Terminal	HIT	A terminal located within the Port of Immingham.
Heavily Modified Water Body	HMWB	Significant water bodies that have changed water category due to modifications.
Habitats Regulations Assessment	HRA	An assessment of projects (or plans) potentially affecting European Sites in the UK, required under the Habitats Directive and Regulations. Also known as an assessment of implications on European Sites
The Institute of Estuarine & Coastal Studies	IECS	The Institute of Estuarine & Coastal Studies (IECS) is a multi-disciplinary Environmental Research Consultancy with experience in the marine, coastal and estuarine environment.
Institute of Environmental Management and Assessment	IEMA	A professional body for practitioners working in the fields of environmental management and assessment.
International Maritime Organization	IMO	The International Maritime Organization is a specialised agency of the United Nations responsible for regulating shipping.
Invasive Non-native Species	INNS	Non-native UK plants that are invasive, for example Japanese Knotweed.
Immingham Outer Harbour	IOH	Immingham Outer Harbour is an area which partly makes up infrastructure located at the Port of Immingham.
Immingham Oil Terminal	IOT	An oil terminal operating out of the Port of Immingham.
Improvement Programme for England's Natura 2000 Sites	IPENS	A programme to develop a strategic approach to achieving favourable condition on these sites by reviewing: the risks and issues that are impacting on and/or threatening the condition of the site.

Term	Acronym	Definition
Joint Cetacean Protocol	JCP	This survey was undertaken to inform the identification of discrete and persistent areas of relatively high harbour porpoise density in the UK marine area.
In-combination Climate Change Impacts	JNCC	The JNCC are the public body that advises the UK Government and devolved administrations on UK-wide and international nature conservation.
Lincolnshire Ecological Records Centre	LERC	A statutory designation made under Section 21 of the National Parks and Access to the Countryside Act 1949 by principal local authorities.
Local Geological Sites	LGS	Non-statutory geological sites considered worthy of protection for their earth science or landscape importance. Formerly known as Regionally Important Geological Sites.
Local Nature Reserve	LNR	A statutory designation made under Section 21 of the National Parks and Access to the Countryside Act 1949 by principal local authorities.
Likely Significant Effect	LSE	Schedule 4 of the Regulations requires an environmental statement to include a description of the likely significant effects of the development on the environment.
Local Wildlife Site	LWS	Non-statutory sites of nature conservation value that have been designated 'locally'. These sites are referred to differently between counties with common terms including site of importance for nature conservation, county wildlife site, site of biological importance, site of local importance and sites of metropolitan importance.
Multi-Agency Geographic Information for the Countryside	MAGIC	A website which provides geographic information about the natural environment.
Marine Aggregate Levy Sustainability Fund	MALSF	The Levy was introduced as a means to better reflect the environmental costs of winning primary construction aggregates, and to encourage the use of alternative, secondary and recycled construction materials.
Marine and Coastal Access Act 2009	MCAA	The Act introduces a new system of marine management. This includes a new marine planning system, which makes provision for a statement of the Government's general policies, and the general policies of each of the devolved administrations, for the marine environment, and also for marine plans which will set out in more detail what is to happen in the different parts of the areas to which they relate

Term	Acronym	Definition
Marine Conservation Zone	MCZ	Marine Conservation Zones are areas that protect a range of nationally important, rare or threatened habitats and species
Mean High Water Springs	MHWS	The height of Mean Water High Springs is the average throughout the year, of two successive high waters, during a 24-hour period in each month when the range of the tide is at its greatest.
Marine Migrant species	MM	Marine species that spawn at sea and regularly enter estuaries in large numbers, thus having a temporary residence in the estuarine habitat; they usually are highly euryhaline species, able to move throughout the full length of the estuary, and spending much of their life within estuaries, using these habitats as nursery grounds or visiting them regularly at sub-adult and adult life stages.
Marine Management Organisation	MMO	The Marine Management Organisation is an executive non-departmental public body in the United Kingdom established under the Marine and Coastal Access Act 2009, with responsibility for English waters.
Marine Policy Statement	MPS	The UK Marine Policy Statement provides the framework for preparing Marine Plans and is key when making decisions directly affecting the marine environment.
Marine Straggler species	MS	A category of fish that enter estuaries infrequently and usually in low numbers,
National Biodiversity Network	NBN	A collaborative venture in the United Kingdom, which facilitates access to biodiversity information.
Nationally Significant Infrastructure Project	NSIP	A type of project listed in the Planning Act 2008, which must be consented by a Development Consent Order.
Natural England	NE	Executive non-departmental public body constituted under the Natural Environment and Rural Communities Act 2006 (section 2(1)) to ensure that the natural environment is conserved, enhanced and managed for the benefit of present and future generations, thereby contributing to sustainable development.
Natural Environment and Rural Communities	NERC	The act created Natural England and the Commission for Rural Communities and, amongst other measures, it extended the biodiversity duty set out in the Countryside and Rights of Way Act to public bodies and statutory undertakers to ensure due regard to the conservation of biodiversity.

Term	Acronym	Definition
National Policy Statement for Ports	NPSfP	The National Policy Statement for Ports provides the framework for decisions on proposals for new port development.
Permanent Threshold Shift	PTS	A permanent reduction of the sensitivity of the ear, decreasing the ability of the ear to detect sound.
Planning Act 2008	PA	An Act of Parliament in the UK intended to speed up the process of approving major new infrastructure projects.
Polycyclic Aromatic Hydrocarbons	PAH	A polycyclic aromatic hydrocarbon is a chemical compound containing only carbon and hydrogen that is
Preliminary Environmental Information Report	PEI Report	A report that compiles and presents the Preliminary Environmental Information gathered for a project.
Planning Inspectorate	PINS	An executive agency with responsibilities for planning appeals, national infrastructure planning applications, local plan examinations and other planning-related casework in England and Wales.
Particle Size Analysis	PSA	Particle size analysis is used to characterise the size distribution of particles in a given sample.
Wetlands of international importance, designated under The Convention on Wetlands (Ramsar, Iran, 1971)	Ramsar	Wetlands of international importance designated under the Ramsar Convention
Regional Environmental Characterisation	REC	A regional assessment of the geology, ecology and archaeology of the seafloor using information gathered through desk based assessment, geophysical data and sampling surveys.
Roll On-Roll Off	Ro-Ro	A design to allow vehicles to drive on and drive off ships.
Royal Society for the Protection of Birds	RSPB	Nature conservation charity for the protection of birds.
Special Area of Conservation	SAC	Sites designated under EU legislation for the protection of habitats and species considered to be of European interest.
Small Cetaceans in European Atlantic Waters and the North Sea	SCANS	A series of large-scale surveys for cetaceans in European Atlantic waters was initiated in 1994 and continued in 2005 and 2007 with the purpose of providing estimates of abundance needed to put bycatch in a population context and to allow EU member States to discharge their responsibilities under the Habitats Directive.

Term	Acronym	Definition
Special Committee on Seals	SCOS	Sites designated under the European Directive on the Conservation of Wild Birds for the protection of birds in member states.
Sea Mammal Research Unit	SMRU	The parameter by which sound levels are measured in air. It is measured in decibels. The threshold of hearing has been set at 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dB at a distance of 1 metre and a change of 3dB in a time varying sound signal is commonly regarded as being just detectable. A change of 10dB is subjectively twice, or half, as loud.
Special Protection Area	SPA	Sites designated under the European Directive on the Conservation of Wild Birds for the protection of birds in member states.
Sound Pressure Levels	SPL	The parameter by which sound levels are measured in air. It is measured in decibels. The threshold of hearing has been set at 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dB at a distance of 1 metre and a change of 3dB in a time varying sound signal is commonly regarded as being just detectable. A change of 10dB is subjectively twice, or half, as loud.
Suspended Sediment Concentrations	SSC	Suspended sediment concentration is the total value of both mineral and organic material carried in suspension by a river.
Site of Special Scientific Interest	SSSI	Area of land notified by Natural England under section 28 of the Wildlife and Countryside Act 1981 as being of special interest due to its flora, fauna or geological or physiological features
Total Organic Carbon	TOC	Total Organic Carbon (TOC) is a measure of the total amount of carbon in organic compounds in pure water and aqueous systems.
Transitional and Coastal Waters	TraC	The transitional zone of water between river and sea.
Trailer Suction Hopper Dredger	TSHD	Trailer suction hopper dredgers are oceangoing vessels that can collect sand and silt from the seabed and transport it over large distances.
Temporary Threshold Shift	TTS	A noise-induced threshold shift that fully recovers over time.
United Kingdom	UK	-

Term	Acronym	Definition
Wildlife and Countryside Act 1981	WCA	This legislation protects various animals, plants, habitats in the UK.
Wetland Bird Survey	WeBS	The Wetland Bird Survey monitors non-breeding waterbirds in the UK.
Water Framework Directive	WFD	A European Union Directive which commits member states to achieve good status of all waterbodies (both surface and groundwater), and also requires that no such waterbodies experience deterioration in status. Good status is a function of good ecological and good chemical status, defined by a number of elements.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 11: Traffic and Transport

Associated British Ports

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Table of contents

Chapter Pages

Tables

11 Traffic and Transport

11.1 Introduction

11.1.1 This chapter presents the preliminary findings of the assessment of the likely effects of the construction of the Project on local and wider transport links within the Immingham area, and is based on the results of baseline assessments and studies of potential future impacts.

11.1.2 There may be interrelationships related to the potential effects on traffic and transport and other disciplines. Therefore, also refer to the following chapters

a. **Chapter 6: Air Quality**.

b. **Chapter 7: Noise and Vibration**.

11.1.3 This chapter is supported by the following figures and appendices:

a. **Figure 11.1: Study Location** (PEI Report, Volume III).

b. **Figure 11.2: Local Highway Network** (PEI Report, Volume III).

c. **Figure 11.3: Public Right of Way (PRoW) Network** (PEI Report, Volume III).

d. **Figure 11.4: Collision Locations** (PEI Report, Volume III).

e. **Appendix 11.A: Collision Data** (PEI Report, Volume IV).

f. **Appendix 11.B: Baseline Traffic Data** (PEI Report, Volume IV).

g. **Appendix 11.C: Trip Generation** (PEI Report, Volume IV).

h. **Appendix 11.D: Trip Assignment** (PEI Report, Volume IV).

11.2 Approach to Assessment

11.2.1 The assessment scenario considered in PEI Report chapter relates solely to the Construction phase - assuming a worst case that construction commences in 2024 with a peak of construction in 2025.

Scope and Methods

11.2.2 A scoping exercise was undertaken in August 2022 to establish the form and nature of the traffic and transport assessment, and the approach and methods to be followed.

11.2.3 The Scoping Report (**Appendix 1.A** of the PEI Report, Volume IV) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on traffic and transport.

11.2.4 Following receipt of the Scoping Opinion (**Appendix 1.B** of the PEI Report, Volume IV) regarding the information to be provided in the Environmental Statement (ES), the following requirements set out in **Table 11.1** have been identified by the Planning Inspectorate which will be taken into account as part of the ongoing traffic and transport assessment.

Table 11.1 Scoping Opinion comments on traffic and transport

Consultee	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	The Scoping Report proposes that no assessment of the decommissioning aspect of the Proposed Development be undertaken because the number of vehicles and the future baseline cannot be predicted at this time, and any assessment would not be accurate. Subject to the provision of the Outline Decommissioning Plan secured within the DCO, the Inspectorate agrees to scope out this matter from the ES.	Noted.
	The ES should provide robust justification for the study area, supported with figures where necessary to show the extent of the affected road network (ARN) considered and any agreement regarding the approach with relevant consultation bodies.	Noted. The study area is set out within **Section 11.2** and shows the affected road network.
	The Automated Traffic Counts (ATCs) and Manual Classified Counts (MCCs) surveys should be clearly explained and justified as part of the methodology used to determine likely effects. The proposed ATC/ MCC locations should be included in the ES, supported by figures which clearly identify these and the locations should be agreed on with the relevant consultation bodies, where possible.	Noted. The details of the baseline traffic data is included within **Section 11.3**.
Royal Mail	Every day in exercising its statutory duties Royal Mail vehicles use all of the main roads that may potentially be affected by the proposed Immingham Green Terminal ("IGT"). Any periods of road disruption / closure, night or day, on or to the roads immediately connected to the IGT or the surrounding highway network will have the potential to impact operations and may consequently disrupt Royal Mail's ability to meet its Universal Obligation service delivery targets.	The timings and the routes construction vehicles will use will be managed through a construction traffic management plan in which vehicles will be required to use specific routes to access the site and at certain times with little to no traffic during the night. Minimal impact is anticipated within the town of Immingham itself. This is included within the mitigation section.

Consultee	Summary of Response	How comments have been addressed in this chapter
North East Lincolnshire Council (Highways)	Content with the scope of the traffic and transport assessment.	No response required.
East Lindsey District Council	No comments on the Scoping Report.	No response required.

11.2.5 During operation of the Terminal, minimal site traffic will be generated. For the hydrogen production facility, there will be Heavy Goods Vehicles (HGVs) accessing the Site for loading and distribution of the green hydrogen that will be produced. An operational access route to the Jetty will be required to the east of the East Site, and this route would run from Laporte Road to the Jetty via roadway of 4.5m width with passing places to allow two way vehicle movement and it might be possible, in part, to use the proposed maintenance track for the pipeline which would run between the Jetty and the East Site.

11.2.6 Conservatively the number of HGVs expected to access the Site during the operational phase is 49 per day in and out (98 two way). Based on this volume of traffic, the levels are below the screening threshold of including highway links where traffic flows will increase by more than 30% as outlined in the Guidelines for the Environmental Assessment of Road Traffic 1993 (Ref 11-1). Therefore, as set out in the Scoping Report (**Appendix 1.A** of PEI Report Volume IV), the levels of operational traffic have now been confirmed, and an operational assessment of the Project is therefore not being undertaken.

11.2.7 Having regard to the information presented within the Scoping Report (**Appendix 1.A** of PEI Report, Volume IV), the Planning Inspectorate's Scoping Opinion (**Appendix 1.B** of the PEI Report, Volume IV) has confirmed the Applicant's view that significant traffic and transportation effects during Project decommissioning are unlikely. Accordingly, this matter will remain scoped out of consideration in the ES.

11.2.8 This assessment therefore focusses on potential construction traffic effects, both from construction workers accessing the Site and HGV deliveries required during the construction phase.

Legislation, Policy and Guidance

11.2.9 **Table 11.2** presents the legislation, policy and guidance relevant to the traffic and transport assessment and details how their requirements will be met by the Project.

Table 11.2: Relevant Legislation, Policy and Guidance Regarding Traffic and Transport

Legislation/ Policy/ Guidance	Consideration within the PEI Report
Guidelines for the Environmental Assessment of Road Traffic 1993 (Ref 11-1)	
Sets out the assessment methodology for road traffic assessments. The main consideration being the two rule approach would be used to assess the extent of any assessment: • Rule 1 – include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%).	The thresholds set out within the guidelines have been used as the basis for the traffic and transportation impact assessment as reported herein and to be applied in the ES.

Legislation/ Policy/ Guidance	Consideration within the PEI Report
• Rule 2 – include any other specific sensitive areas where traffic flows have increased by 10% or more.	
National Policy Statement for Ports (NPSfP) 2012 (Ref 11-7)	
The NPSfP is a framework to address proposals for port development in the UK and associated development (rail and road). This describes the UK Government's conclusions on new port infrastructure in the context of future demand, needs and the current economy. The Project is considered to be a Nationally Significant Infrastructure Project (NSIP) within the ports industry. Section 5.4.4 states that the assessment should distinguish between the construction, operation and decommissioning project stages as appropriate. Section 5.4.5 states that where appropriate, a travel plan including demand measurement measures to mitigate transport impacts should be prepared.	The NPSfP requirements have been considered within this traffic and transport assessment, which indicates that the impact is not considered to be severe
National Planning Policy Framework (NPPF) 2021 (**Ref 11-3)**	
NPPF paragraph 32 states *"developments should only be prevented or refused on transport grounds where the residual cumulative impacts of development are severe".* This policy sets out the guidance in relation to the impact of developments and when they should be refused.	The NPPF requirements have been considered within this traffic and transport assessment, which indicates that the impact is not considered to be severe.
Planning Practice Guidance (2016) (**Ref 11-4)**	
Travel Plans, Transport Assessments and Statements. This provides general guidelines for travel plans, transport assessments and statements.	The guidance has been taken into account when defining the traffic and transportation assessment methodology applied.
Standards for Highways (Ref 11-5)	
Design Manual for Road and Bridges (DMRB) CD 123 - Geometric design of at-grade priority and signal-controlled junctions. Outlines the geometric parameters in relation to the design of new junctions.	These design standards are being taken into account by the design of new junction arrangements as required by the Project.

Study Area

11.2.10 The Project is located in the vicinity of the Port, which is owned and operated by Associated British Ports (ABP), in an area that has significant industrial presence.

11.2.11 The area of study is defined by roads where there may be potential for significant effect(s) due to the additional traffic associated with the Project.

11.2.12 As part of the preliminary assessment, the following links have been included which define the traffic and transport study area as comprising the immediate network and the route to the Strategic Road Network.:

a. A180 East - Between East of A180/ A1173 Junction.
b. A1173 - Between A1173/ Kiln Lane and A1173/ Kings Road.
c. Queens Road - between A1173/ Kings Road and Queens Road/ Laporte Road.
d. Kings Road - between A1173/ Kings Road and Kings Road/ Pelham Road.
e. Manby Road - between A160/ Manby Road and Kings Road/ Pelham Road.
f. A160 - Between Manby Road/ A160 and A160/ A1077 Roundabout.
g. A160 - Between A160/ A1077 Roundabout and A160/A180.
h. A180 West - Between A180/ A1173 and A180/ A160.

11.2.13 The traffic and transport study area is illustrated in **Figure 11.1** (PEI Report, Volume III).

Assessment of Significance

11.2.14 The Institute of Environmental Management and Assessment (IEMA) Guidelines document includes guidance on how the sensitivity of receptors should be assessed. Based on the nature of the land use and the routes currently within the study area, the sensitivity of all traffic and transport links is considered to be low, as whilst there are a small number of properties along Queens Road, it is considered that these are few in number and there are no sensitive locations such as schools or hospitals. It is therefore considered that Queens Road would fall into the low sensitivity category and, **Table 11.3** provides an overview of how the link sensitivity has been established.

Table 11.3 Link Sensitivity Categorisation

Receptors	Built Environment Indicator along Highway Link	Highway Link Sensitivity to Changes in Traffic Flow
People at home	Residential Properties	Medium: Where there are a number of properties with direct frontage to the highway link being used as a construction route.

Receptors	Built Environment Indicator along Highway Link	Highway Link Sensitivity to Changes in Traffic Flow
		Low: Where there are few properties with direct frontage to the highway link being used as a construction traffic route.
People in workplaces	Offices, industrial units, employment uses	Low: Employment users therefore no residential impact, could already have HGV traffic.
Sensitive groups (children, elderly and disabled)	Schools, play areas, care/retirement homes, disabled parking bays	High: Where there are multiple indicators of sensitive groups with direct frontage onto the highway link being used as a construction traffic route
		Medium: Where one indicator of sensitive groups is present with direct frontage onto the highway link being used as a construction traffic route
		Low: Where no indicator of sensitive groups are present
Sensitive locations (Hospitals, places of worship, schools historic buildings)	Hospitals, places of worship, schools, historic buildings	High: Where there are multiple indicators of sensitive locations
		Medium: Where one indicator of a sensitive location is present
		Low: Where no indicator of sensitive locations are present
People walking	Footways, PRoW, crossings	Medium: Indicators present on highway link

Receptors	Built Environment Indicator along Highway Link	Highway Link Sensitivity to Changes in Traffic Flow
		Low: Indicators not present on highway link
People cycling	On/off-road designated cycle routes	Medium: On-road designated cycle routes present along highway link
		Low: Off-road designated cycle routes present along highway link
Open spaces, recreational sites, shopping areas	Parks, play areas, shops, community centers	High: Where there are multiple instances or indicators likely to be used by sensitive groups (i.e. children)
		Medium: Where one indicator is present that is likely to be used by sensitive groups (i.e. children)
		Low: Indicators that are unlikely to be used by sensitive groups
Road users	Roads, junctions, road classification, baseline traffic volumes, signage.	Determined by the presence of other affected parties in this table

11.2.15 The following environmental effects are susceptible to changes as a result of the Project, with residential and business amenity being included within **Chapter 7: Noise and Vibration**.

a. **Severance:** Severance occurs in a community when a major traffic artery separates people from places and other people. Severance occurs from difficulty of crossing a road or where the road itself creates a physical barrier. Severance can be caused to pedestrians or motorists. The Guidelines for the Environmental Assessment of Road Traffic (Ref 11-1) suggest that changes in total traffic flow of 30%, 60% and 90% result in slight, moderate and substantial changes in severance respectively.

b. **Pedestrian Amenity:** Pedestrian amenity is broadly defined as the relative pleasantness of a journey, and is considered to be affected by factors such as traffic flow, traffic composition, pavement width and separation between

vehicles and pedestrians. The impact manifests itself in fear and intimidation, exposure to noise and vehicle emissions. The Guidelines for the Environmental Assessment of Road Traffic (Ref 11-1) suggest that a doubling or halving of total traffic flow or the HGV composition could lead to perceptible negative or positive impacts upon pedestrian amenity.

c. **Fear and Intimidation:** The volume of traffic and its HGV composition are the factors that contribute to fear and intimidation. In the absence of thresholds set out in the Guidelines for the Environmental Assessment of Road Traffic (Ref 11-1**)** this PEI Report considers that changes in total traffic flow of 30%, 60% and 90% are considered to result in slight, moderate or substantial impacts.

d. **Highway Safety**: Highway safety is assessed by the frequency and severity of injury accidents that are attended by the police and recorded in official accident statistics. Intensification of use or changes in the composition of traffic has the potential to have an effect on collision rates. The examination of recent collision statistics on routes within the Study Area will highlight any hotspots that need further examination.

e. **Driver Delay**: The use of industry standard junction capacity modelling programs provides a methodology to quantify junction delay. Driver delay is only likely to be significant where the existing Study Area highway network is at or close to capacity.

f. **Hazardous Loads**: Assessed based on the estimated number and composition of such loads. Where the number of movements is considered to be significant, a risk analysis should be undertaken to illustrate the potential for an accident to happen and the likely effect of such an event.

Table 11.4 ES Magnitude Criteria

Impact	Very Low	Low	Medium	High
Construction Traffic	Occasional construction vehicles using roads over a short period of time. Less than 5% Increase for more than 6 months; Between 6-30% increase for 3- 6 months; or Between 31-40% for less than 3 months.	Small number of construction vehicles using roads over a short period of time. 6-15% increase for more than 6 months; 16-39% for 3-6 months; or 40% increase for less than 3 months.	Moderate number of construction vehicles using roads over a protracted time period. 16-39% increase for more than 6 months; or More than 40% increase for 3-6 months.	High number of construction vehicles using roads over a protracted period of time. More than a 40% increase for more than 6 months.
Severance	Increase in total traffic flows of 29%	Increase in total traffic flows of 30-	Increase in total traffic flows of 60%-	Increase in total traffic flows or HGV

Impact	Very Low	Low	Medium	High
	or under (or increase in HGV flows under 10%).	59% (or increase in HGV flows of between 20%-39%.	89% (or increase in HGV flows between 40%-89%.	flows of 90% and above.
Pedestrian Delay	Total traffic flows under 1,400 per hour.	Where traffic flows exceed 1,400 vehicles per hour the severity of the impact will be determined on a case-by-case basis based on receptor sensitivity.		
Pedestrian Amenity	Increase in total traffic flows of 49% or under.	Increase in total traffic flows of 50-69%.	Increase in total traffic flows of 70%-99%.	Increase in total traffic flows of 100% or above.
Fear and Intimidation	Increase in total traffic flows or HGV flows of 29% or under (or increase in HGV flows under 10%).	Increase in total traffic flows of 30-59% (or increase in HGV flows of between 10%-39%).	Increase in total traffic flows of 60%-89% (or increase in HGV flows between 40%-89%).	Increase in total traffic flows or HGV flows of 90% and above.
Driver Delay	Increase in total traffic flow of less than 29%.	Increase in total traffic flow of between 30% and 59%.	Increase in total traffic flow of between 60% and 89%.	Increase in traffic flow of 90% and above.
Highway Safety	Increase in total traffic flows of 30% or under (or increase in HGV flows under 10%).	All links estimated to experience increases in total traffic flows above 30% or increases in HGV flows above 10% are analysed further on a case by case basis.		
PRoW	Increase in total traffic flows or HGV flows of 29% or under (or increase in HGV flows under 10%) on a link intersecting a PRoW. Or Where there would be a temporary increase in pedestrian journey length along a road or other PRoW of one to five days due to short term	Increase in total traffic flows of 30-59% (or increase in HGV flows of between 10%-39%) on a link intersecting a PRoW. Or Where there would be a temporary increase in pedestrian journey length along a road or other PRoW of one to four weeks due to short term	Increase in total traffic flows of 60%-89% (or increase in HGV flows between 40%-89%) on a link intersecting a PRoW Or Where there would be a temporary increase in pedestrian journey length along a road or other PRoW for more than four weeks due to short term closure	Increase in total traffic flows or HGV flows of 90% and above on a link intersecting a PRoW. Or Where there would be a short term closure of the PRoW without a diversion route for more than four weeks in any 12 month period

Impact	Very Low	Low	Medium	High
	closure (managed) of the PRoW	closure (managed) of the PRoW	(managed) of the PRoW	

Table 11.5. Significance of Effects Matrix

Sensitivity of receptor	Magnitude			
	High	Medium	Low	Very Low
High	Major– Significant	Major– Significant	Moderate– Significant	Minor– Not Significant
Medium	Major– Significant	Moderate– Significant	Minor– Not Significant	Negligible – Not Significant
Low	Moderate– Significant	Minor– Not Significant	Negligible – Not Significant	Negligible – Not Significant
Very Low	Minor– Not Significant	Negligible – Not Significant	Negligible – Not Significant	Negligible – Not Significant

Limitations and Assumptions

11.2.16 The information presented in this preliminary assessment reflects that obtained and evaluated at the time of reporting and is based on an emerging design for the Project and the maximum likely extents of land required for its construction and operation.

11.2.17 The baseline traffic data used to form the basis for the assessment are based on secondary data from surveys undertaken on behalf of ABP as part of the Immingham Eastern Ro-Ro Terminal (IERRT) proposed development. The data used was recorded in 2021 from the David Tucker Associates Preliminary Transport Assessment, although it should be noted that no data was available for Laporte Road - as such, this link has not been included within this preliminary assessment. An Automated Traffic Count (ATC) will be undertaken on Laporte Road so that it can be included within the assessment to be reported in the ES.

11.2.18 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further through the assessment and consultation processes, and as further research and investigative surveys are completed to fully understand its potential effects. However, the assessment is based on conservative assumptions in accordance with the use of the Rochdale Envelope approach and is therefore considered to represent the worst case.

11.2.19 This assessment does not include the opening year of the Project due to the worst case year being assessed. The assessment also does not include the decommissioning stage, as traffic volumes are currently not known at present for a 25 year horizon, and this has been scoped out by the Planning Inspectorate.

11.3 Baseline Conditions

Highway Network

11.3.1 The existing baseline highway network comprises an area that is largely industrial in nature, with very few residential properties other than in the north as the A1173 travels through the northern edge of Immingham. The only major residential area is the town of Immingham located to the south of the Dock.

11.3.2 Queens Road is a single carriageway road providing a link from the Port areas towards the A1173, where it becomes Kings Road. Queens Road has a footway along the northern side and is street lit with right turn ghost islands into major side roads. Whilst the road is considered to be industrial in character there are several dwellings and light industrial activities located along the Queens Road adjacent to and opposite the northern boundary of the western site

11.3.3 Kings Road is a single carriageway and connects with Queens Road to then form a three arm roundabout junction with the A1173, where Kings Road then continues to the north to form a link into Immingham. The A1173 Manby Road then continues through the edge of Immingham to provide a link to the A160 in the north. It has street lighting and a footway heading northbound along one side of the road, and in the vicinity of the Site is considered to be industrial in character, although this does change to residential to the north as it enters Immingham.

11.3.4 The A1173, which is formed in part by Kings Road in the north, continues south as a single carriageway to form a three arm roundabout with Kiln Lane before continuing south to form a grade separated junction with the A180. It is rural/ industrial in nature and between Kings Road and Kiln Lane does not have any footway or street lighting.

11.3.5 Approximately mid-way between the Kiln Lane roundabout and the junction with the A180 there is a roundabout on the A1173 which provides access into adjacent land, and there is a footway along the section leading to Kiln Lane, but no facility on the section leading to the A180.

11.3.6 Kiln Lane is a single carriageway and connects to the A1173 at a four-armed roundabout (A1173 heading both north and west). At this roundabout it also connects to several roads serving industrial estates (Stallingborough Industrial Estate, Industrial Estate South).

11.3.7 The A160 heads west from the A1173 and connects to the A180. Both of these links are part of the strategic road network (SRN) and are maintained by National Highways. The A180 heads east to Grimsby and west towards the closest motorway (M180) and provides the link from the local area to the wider highway network within the region.

11.3.8 **Figure 11.2** (PEI Report, Volume III) shows the local highway network in relation to the Project.

Cycle Networks and PRoW baseline

11.3.9 In terms of National Cycle Networks (NCN) and Public Rights of Way (ProW), there are no routes within this area that would likely be affected by traffic associated with the Project based on the proposed traffic routing (outlined in the trip distribution section below), and as such no disruption to the NCN is anticipated.

11.3.10 The locations of the PRoW within the vicinity of the Site are shown in **Figure 11.3** (PEI Report, Volume III). There would be no additional impact on users of Public Footpath 32, but there would be temporary disruption to users on Public Bridleway 36 between Immingham and Grimsby. Part of Public Bridleway 36 would be closed during construction period, with no temporary diversion in place, as a worst case.

11.3.11 Pedestrian facilities are limited on the local road network in the vicinity of the Project, with a footway along one side of Queens Road and along the northern side of the A1173 Kings Road providing a link into Immingham.

Road Safety

11.3.12 An analysis of traffic collision data, using data provided by NELC for a period of five years (2017-2022), has been undertaken, with the full set of data included within **Appendix 11.A** (PEI Report, Volume IV) and shown by location on **Figure 11.4** (PEI Report, Volume III). Collision data includes a cordon that stretches around Immingham, including the A180 and A1173.

11.3.13 Traffic collision data by year and severity are shown in **Table 11.6**.

Table 11.6 Traffic Collision Data Analysis

Year						
Severity	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
Slight	9	11	11	10	17	4
Serious	4	7	5	9	0	3
Fatal	0	0	0	0	0	0

11.3.14 **Table 11.3** shows that there was a total of 90 collisions between 2017 and 2022 in this area. Of these, 62 were classified as slight, 28 were serious, with no fatal accidents being identified.

11.3.15 In terms of collisions there has only been one collision within the vicinity of the Project access roundabout and as such this is not considered to be an accident hotspot.

11.3.16 As illustrated on **Figure 11.4** (PEI Report, Volume III), the majority of the accidents have occurred within the built up area of Immingham, and whilst any incident is clearly undesirable, no construction HGV traffic associated with the Project would be routed through this residential area. In relation to the

operational phases, it is likely some vehicles (cars) will travel through Immingham however given the anticipated traffic generation associated with this phase no increased safety risk is predicted.

11.3.17 At the A1173/ A180 junction there has been a total of four accidents (three slight and one serious) and again whilst any incident is undesirable, this is not considered to constitute an existing road safety issue at this location.

11.3.18 Overall, it is concluded that there are no existing highway safety issues that would need to be addressed as part of this Project.

Existing Traffic Flows

11.3.19 The highway links detailed in **Paragraph 11.2.13** form the highway network of interest for this assessment (the study area).

11.3.20 Baseline 24 hour annual average daily traffic (AADT) two-way link flows for the study area are presented in **Table 11.7**, including the percentage of HGVs. Such data have been obtained from the Transport Assessment that supports of the IERRT proposed development. Baseline data have been included as part of **Appendix 11.B** (PEI Report, Volume IV).

Table 11.7 2021 Baseline AADT Traffic Flows

Link	Link Description	Link Sensitivity	2021		
			All Vehicles	HGV	HGV %age
1	A180 E - Between East of A180/ A1173 Junction	Low	34,246	3,253	9%
2	A1173 - Between A1173/ Kiln Lane and A1173/ Kings Road	Low	7,384	795	11%
3	Queens Road - between A1173/ Kings Road and Queens Road/ Laporte Road	Low	3,883	566	15%
4	Kings Road - between A1173/ Kings Road and Kings Road/ Pelham Road	Low	7,722	568	7%
5	Manby Road - between A160/ Manby Road and Kings Road/ Pelham Road	Low	3,713	570.5	15%
6	A160 - Between Manby Road/ A160 and A160/ A1077 Roundabout	Low	10,536	5,048	48%
7	A160 - Between A160/ A1077 Roundabout and A160/A180	Low	12,102	5,328	44%

Link	Link Description	Link Sensitivity	2021		
			All Vehicles	HGV	HGV %age
8	A180 W - Between A180/ A1173 and A180/ A160	Low	25,546	3,837	15%

Source – David Tucker Associates (2021)

Future Baseline

11.3.21 Subject to consent being granted for the Project, there would be a phased approach to construction, with the construction of the jetty, and first phase of the processing facility, being expected to start in Quarter (Q) 2 of 2025and completed in 2026. The remaining phases would be completed incrementally, completing in 2035.

11.3.22 Based on the information in relation to the construction traffic flows, the peak level of construction traffic is expected to be in 2025, and as such this year has been used as the future assessment year.

11.3.23 Future year baseline traffic flows for the assessment year of 2025 for the peak of construction have been derived by applying the national standard programme Trip End Model Presentation Program (TEMPRO) to derive traffic growth factors, as indicated in **Table 11.8**. These growth factors have been taken into account when comparing the baseline and future traffic scenarios.

Table 11.8 Traffic Growth Factors

Year	Growth Factor
2021 - 2025	1.0613

11.3.24 The peak of construction 2025 baseline traffic flows have been calculated as illustrated in **Table 11.9.**

Table 11.9 2025 Baseline AADT Traffic Flows

Link	Link Description	2025		
		All Vehicles	HGV	HGV %age
1	A180 E - Between East of A180/ A1173 Junction	36,345	3,452	9%
2	A1173 - Between A1173/ Kiln Lane and A1173/ Kings Road	7,837	844	11%
3	Queens Road - between A1173/ Kings Road and Queens Road/Laporte Road	4,121	601	15%
4	Kings Road - between A1173/ Kings Road and Kings Road/ Pelham Road	8,195	603	7%

Link	Link Description	2025		
		All Vehicles	HGV	HGV %age
5	Manby Road - between A160/ Manby Road and Kings Road/ Pelham Road	3,941	605	15%
6	A160 - Between Manby Road/ A160 and A160/ A1077 Roundabout	11,182	5,357	48%
7	A160 - Between A160/ A1077 Roundabout and A160/ A180	12,844	5,655	44%
8	A180 W - Between A180/ A1173 and A180/ A160	27,112	4,072	15%

11.3.25 With reference to **Paragraph 11.2.6**, future year baseline traffic flows for the Project opening year have not been generated given that a quantitative assessment of operational traffic is not considered necessary as the levels are below the screening threshold for assessment outlined in the Guidelines for the Environmental Assessment of Road Traffic 1993, as set out in **Paragraph 11.2.4**.

11.3.26 The trip generation section below provides an overview of the anticipated flows associated with the operation at the Site.

11.4 Design, Mitigation and Enhancement Measures

Embedded Mitigation Measures

11.4.1 The Project has been designed, as far as possible, to avoid and minimise environmental impacts and effects through the process of design development, and by embedding mitigation measures into the design.

11.4.2 In terms of design mitigation, the Project construction phase would be designed to minimise waste and materials as far as is possible in order to minimise the need for traffic trips to the Site, and this could be achieved through the pre-fabrication of elements as far as is possible.

11.4.3 All access points that require the creation of a junction bellmouth would be designed based on the relevant standard from Design Manual for Road and Bridges (DMRB) CD 123 Geometric Design of at Grade Priority and Signal-Controlled Junctions (Ref 11-5) and in consultation with the local highway authority, thereby negating any potential safety impact associated with construction activity.

Standard Mitigation Measures

11.4.4 The main approach to mitigating potential traffic impacts would be the use of management measures to reduce as far as is possible the number of vehicle trips on the local highway network.

11.4.5 Prior to the start of the construction phase, the contractor would prepare a Construction Traffic Management Plan (CTMP) to control HGV movements, as well as a Construction Worker Travel Plan (CWTP) to control the trips made by

the construction workers (including encouraging car sharing) and thus reduce the impact of the workforce upon the highway network. The CTMP and CWTP would be based on, and incorporate, the contents and requirements of the Outline CTMP (OCTMP) and Outline CWTP (OCWTP) which will be submitted with the DCO application.

11.4.6 These plans would set out measures and controls to limit the number of trips on the network in the peak hours, and as such would aim to limit the traffic impact of the construction phase as far as possible. Such plans would be implemented for the duration of the Project construction phase.

11.5 Trip Distribution, Generation and Assignment and Potential Impacts

11.5.1 This section provides an overview of the trip distribution, generation and assignment associated with traffic at the Site, and the knock-on potential impacts.

Trip Distribution

11.5.2 Construction worker trip distribution to the Project has been based on 2011 census data using WU03EW - Location of usual residence and place of work by method of travel to work (MSOA level) for North East Lincolnshire 001 (Ref 11-6). This is considered reasonable as it covers the residential area of Immingham, as well as the Port area where the Project would be located.

11.5.3 In relation to the HGV distribution, it is assumed that all construction vehicles would travel to and from the site via the A1173 towards the A180 where they have been distributed based upon the existing pattern of movements. This is considered to be an acceptable methodology as the exact location of construction material required for the Project is not known at this preliminary stage, with no HGVs being distributed through the residential area of Immingham to the north.

Trip Generation

11.5.4 The trip generation flows have been supplied by Air Products which provides an overview of the daily HGV numbers and daily workforce associated for each phase of Project construction – data are included within **Appendix 11.C** (PEI Report, Volume IV). The trip generation includes all vehicles associated with the construction including all waste removal along with the associated workforce and will be reviewed as part of the studies associated with the ES Chapter to ensure that it is still valid.

11.5.5 As stated earlier, the first phase of construction works (2025) is predicted to generate the largest numbers of HGVs and daily workforce trips. As such, this is the only scenario that has been assessed as part of this preliminary assessment. The other stages of Project construction would generate 50% less traffic, whilst operational traffic flows would be significantly less than those occurring during construction. As noted by the information below the total daily two-way construction flows is 1,666 compared to 292 during the operation of the site.

11.5.6 The daily trip generation during the peak Project construction works is shown in **Table 11.10**.

Table 11.10 Total Daily Development Traffic – Peak of Construction

Type	To	From	Two-Way
HGVS	97	97	194
Workers	736	736	1472
All Vehicles	**833**	**833**	**1,666**

11.5.7 **Table 11.10** shows there would be a total of approximately 1,666 two-way trips generated at the peak of construction, with the majority of the trips associated with workers commuting to and from the Site.

11.5.8 It should be noted that the above provides a robust level of assessment in that all workers have been assumed to travel in a private car, whereas in reality there would be an element of car sharing or use of public transport

11.5.9 In terms of public transport there are bus stops located on Kings Road as well as one bus stop on Laporte Road. These provide access to Grimsby as well as Stallingborough to the south. This therefore potentially provides an alternative for workers and this will be expanded within the full ES Chapter.

11.5.10 **Table 11.11** sets out the total daily development traffic associated with the operational phase.

Table 11.11 Total Daily Operational Traffic

Type	To	From	Two-Way
Workers	104	104	208
HGVs	49	49	98
Total	146	146	292

11.5.11 Based on this volume of traffic, and as set out in **Paragraph 11.2.6**, with staff working on shifts and only around 3 HGVs per hour, the levels are below the screening threshold for assessment outlined in the Guidelines for the Environmental Assessment of Road Traffic 1993. An operational assessment of the Site has therefore not been undertaken.

Trip Assignment

11.5.12 Based on the trip distribution exercise and the proposed trip generation, **Table 11.12** outlines the number of trips on each of the links within the defined study area during the peak construction year (2025), with traffic flow diagrams provided in **Appendix 11.D** (PEI Report Volume IV).

Table 11.12 Trip Assignment – Peak of Project Construction

Link	Link Description	Peak Construction Traffic		
		All Vehicles	Workers	HGVs
1	A180 E - Between East of A180/ A1173 Junction	782	694	88
2	A1173 - Between A1173/ Kiln Lane and A1173/ Kings Road	1255	1060	195
3	Queens Road - between A1173/ Kings Road and Queens Road/ Laporte Road	1666	1471	195
4	Kings Road - between A1173/ Kings Road and Kings Road/ Pelham Road	122	122	0
5	Manby Road - between A160/ Manby Road and Kings Road/ Pelham Road	122	122	0
6	A160 - Between Manby Road/ A160 and A160/ A1077 Roundabout	122	122	0
7	A160 - Between A160/ A1077 Roundabout and A160/ A180	0	0	0
8	A180 W - Between A180/ A1173 and A180/ A160	245	139	106

11.5.13 The trip assignment data has then been used to form the basis for the preliminary assessment.

11.5.14 **Table 11.13** provides an overview of the total percentage increase for total vehicles and HGVs on each of the links within the study area during the peak construction year, 2025.

Table 11.13 2025 Base + Peak of Construction Daily Two-Way Flows

Link No.	Link Description	Sensitivity	2025 Baseline Flow		Construction Traffic		Percentage Increase	
			Total vehicles	Total HGV	Total vehicles	Total HGV	Total vehicles	Total HGV
1	A180 E - Between East of A180/ A1173 Junction	Low	36,345	3,452	782	88	2%	3%
2	A1173 - Between A1173/ Kiln Lane and A1173/ Kings Road	Low	7,837	844	1255	195	16%	23%
3	Queens Road - between A1173/ Kings	Low	4,121	601	1666	195	40%	32%

Link No.	Link Description	Sensitivity	2025 Baseline Flow		Construction Traffic		Percentage Increase	
			Total vehicles	Total HGV	Total vehicles	Total HGV	Total vehicles	Total HGV
	Road and Queens Road/ Laporte Road							
4	Kings Road - between A1173/ Kings Road and Kings Road/ Pelham Road	Low	8,195	603	122	0	1%	0%
5	Manby Road - between A160/ Manby Road and Kings Road/ Pelham Road	Low	3,941	605	122	0	3%	0%
6	A160 - Between Manby Road/ A160 and A160/ A1077 Roundabout	Low	11,182	5,357	122	0	1%	0%
7	A160 - Between A160/ A1077 Roundabout and A160/ A180	Low	12,844	5,655	0	0	0%	0%
8	A180 W - Between A180/ A1173 and A180/ A160	Low	27,112	4,072	245	106	1%	3%

11.5.15 **Table 11.13** indicates that for most of the links within the study area the impact is below 30% for both the total vehicle number and total HGVs, with the increase in HGVs being below 30% on all links, except Queens Road where it is 32%.

11.5.16 With reference to the Guidelines for the Environmental Assessment of Road Traffic (1993) (the GEART Guidelines) (Ref 11-1) a two rule approach can be used to assess the extent of any traffic assessment as follows:

a. Rule 1: include highway links where traffic flows will increase by more than 30% (or the number of HGVs will increase by more than 30%).
b. Rule 2: include any other specific sensitive areas where traffic flows have increased by 10% or more.

11.5.17 Therefore, with reference to **Paragraph 11.2.13**, as the local highway network is deemed to have a low sensitivity, the only link identified to experience a potential impact is along Queens Road. However, this is to be expected as Queens Road provides the main access to the Site. All other road links are therefore not considered to experience an adverse impact and no further assessment is considered to be required.

11.5.18 Given that operational traffic flows would be significantly less than those occurring during Project construction, it is predicted that all road links during

operation would not experience an adverse impact, including on Queens Road and thus no further assessment is considered to be required. During the construction phase the impact would be temporary and would be managed through a Construction Traffic Management Plan and the above impact represents the very peak of the activity on site.

11.6 Assessment of Effects

Construction

11.6.1 **Section 11.5** indicates that the preliminary assessment has identified that Project construction would only potentially result in an adverse traffic and transport impact at one location – namely on Queens Road which is the access road to the Site. This impact is associated with the increase of the total traffic flow on Queens Road as with reference to **Table 11.13**, this is predicted to be increased by 40%, whilst the HGV impact is predicted to be 32%.

11.6.2 The following sections summarise the likely effects on receptors in terms of severance, pedestrian amenity, fear and intimidation and highway safety.

11.6.3 In terms of severance the GEART guidelines (Ref 11-1) state that changes in traffic flow of 30%, 60% and 90% are registered as producing slight, moderate and substantial changes respectively. The magnitude of impact is therefore assumed to be negligible for all receptors apart from Queens Road where is it assessed as being low due to the increase of between 30% and 60%.

11.6.4 For pedestrian amenity, the GEART guidelines (Ref 11-1) state that an indicative threshold would be where the traffic flow (or its lorry component) is halved or doubled. The magnitude of impact is therefore assumed to be very low.

11.6.5 In terms of fear and intimidation, this relates to the impact traffic may have on pedestrians with no commonly agreed threshold for estimating levels of danger or fear and intimidation, although it should be noted that the numbers of pedestrians on the HGV route to the A180 along the A1173 is considered to be very low. The impact is therefore considered to be negligible apart from on Queens Road and the A1173 between Kiln land and Kings Road where it is considered to be low and medium respectively.

11.6.6 For road safety as there is not considered to be an existing accident issue on the local highway, all impacts have been set as negligible.

11.6.7 **Table 11.14** provides an overview of the magnitude of impact of proposed peak construction traffic on each of these metrics, based upon the magnitude of change in **Table 11.13** above, and does not take into account any measures to reduce the impact of construction traffic through the adoption of a CTMP.

Table 11.14 Magnitude of Impact

Link No.	Link Description	Sensitivity	Percentage Increase		Traffic and Transport	Severance	Pedestrian Amenity	Fear and Intimidation	Highway Safety
			Total vehs.	Total HGV					
1	A180 E - Between East of A180/ A1173 Junction	Low	2%	3%	Negligible	Negligible	Negligible	Negligible	Negligible
2	A1173 - Between A1173/ Kiln Lane and A1173/ Kings Road	Low	16%	23%	Low	Negligible	Low	Low	Negligible
3	Queens Road - between A1173/ Kings Road and Queens Road/ Laporte Road	Low	40%	32%	High	Low	Medium	Medium	Negligible
4	Kings Road - between A1173/ Kings Road and Kings Road/ Pelham Road	Low	1%	0%	Negligible	Negligible	Negligible	Negligible	Negligible
5	Manby Road - between A160/ Manby Road and Kings Road/ Pelham Road	Low	3%	0%	Negligible	Negligible	Negligible	Negligible	Negligible
6	A160 - Between Manby Road/ A160 and A160/ A1077 Roundabout	Low	1%	0%	Negligible	Negligible	Negligible	Negligible	Negligible
7	A160 - Between A160/ A1077 Roundabout and A160/ A180	Low	0%	0%	Negligible	Negligible	Negligible	Negligible	Negligible
8	A180 W - Between A180/ A1173 and A180/ A160	Low	1%	3%	Negligible	Negligible	Negligible	Negligible	Negligible

11.6.8 As indicated in **Table 11.14**, the majority of the links included within the assessment would experience either a negligible or low magnitude of impact. The exception being Link 3, Queens Road - between A1173/ Kings Road and Queens Road/ Laporte Road, which would experience a medium impact for some of the assessment criteria because it would provide access to the Site.

11.6.9 With reference to **Table 11.5**, and based upon the above impact magnitudes and the low sensitivity of the transportation links, Project traffic and transportation-related effects are detailed in **Table 11.15** during the peak construction year (2025), and as mentioned previously this is based upon the pre adoption of the CTMP.

Table 11.15 Classification of Traffic and Transportation Effects (during Peak Construction year 2025)

Link No.	Link Description	Traffic and Transport	Severance	Pedestrian Amenity	Fear and Intimidation	Highway Safety
1	A180 E - Between East of A180/ A1173 Junction	Negligible	Negligible	Negligible	Negligible	Negligible
2	A1173 - Between A1173/ Kiln Lane and A1173/ Kings Road	Negligible	Negligible	Negligible	Negligible	Negligible
3	Queens Road - between A1173/ Kings Road and Queens Road/ Laporte Road	Moderate	Negligible	Minor	Minor	Negligible
4	Kings Road - between A1173/ Kings Road and Kings Road/ Pelham Road	Negligible	Negligible	Negligible	Negligible	Negligible
5	Manby Road - between A160/ Manby Road and Kings Road/ Pelham Road	Negligible	Negligible	Negligible	Negligible	Negligible
6	A160 - Between Manby Road/ A160 and A160/ A1077 Roundabout	Negligible	Negligible	Negligible	Negligible	Negligible
7	A160 - Between A160/ A1077	Negligible	Negligible	Negligible	Negligible	Negligible

Link No.	Link Description	Traffic and Transport	Severance	Pedestrian Amenity	Fear and Intimidation	Highway Safety
	Roundabout and A160/ A180					
8	A180 W - Between A180/ A1173 and A180/ A160	Negligible	Negligible	Negligible	Negligible	Negligible

11.6.10 With the implementation of the embedded and standard mitigation measures as detailed in **Section 11.4**, this preliminary assessment of the traffic and transport effects for the Project has concluded that the impact within the defined study area would be either negligible or low, with the exception being Link 3 Queens Road (between A1173/ Kings Road and Queens Road/ Laporte Road) where the impact would be minor. As explained in **Table 22.2** in **Chapter 22: Major Accidents and Disasters**, further assessment is required of the consequences of the operation of the hydrogen production facility on surrounding land uses in terms of major hazard planning. It is currently anticipated that the continued residential use of seven properties on the west side of Queens Road will need to cease, as residential use is unlikely to be compatible with the operation of the hydrogen production facility on the West Site. The Applicant is currently in discussions with the landowners / occupiers of the seven residential properties with a view to negotiating their acquisition. Where it is not possible to acquire those properties through negotiation, acquisition powers for these properties will be sought through the DCO. In the event of acquisition of the properties for the Project ahead of the construction works commencing, an adverse effect on those properties (as assessed in this chapter) would not arise.

11.6.11 Therefore, taking these impact magnitudes into account and the low sensitivity of the transportation links, no significant effects have been identified. In addition, this level of effect is prior to the adoption of the CTMP which will help reduce the impacts of the construction phase as far as is possible.

Operation

11.6.12 During the operational phase, there would be a total of 98 HGVs two way per day and 104 employees, of which only 24 are predicted to work a “normal” eight-hour day and would therefore travel during the network peak hours.

11.6.13 Therefore, based on this volume of traffic, the levels are below the screening threshold for assessment outlined in the Guidelines for the Environmental Assessment of Road Traffic 1993. An operational assessment of the Site has therefore not been undertaken.

11.7 Summary of Preliminary Assessment

11.7.1 **Table 11.16** provides a summary of the preliminary assessment of Project effects on traffic and transport as related to peak traffic flows in construction year 2025.

11.7.2 The preliminary assessment indicates that traffic and transport effects associated with the peak construction phase for the Project within the study area would be

negligible or minor, and therefore not significant through the application of embedded mitigation measures including use of a CTMP and CWTP.

11.7.3 Operational traffic flows would be significantly less than those occurring during the peak of Project construction. As such, traffic and transportation effects during Project operation would also be not significant. Traffic effects during Project decommissioning have been scope out of the assessment.

Table 11.16 Summary of Preliminary Assessment – Likely Significant Effects

Receptor	Impact Pathway	Impact Magnitude	Mitigation Measure	Residual Effect
A180 E - Between East of A180/ A1173 Junction	Traffic flows	Negligible	CTMP/ CWTP	Negligible
A1173 - Between A1173/ Kiln Lane and A1173/ Kings Road	Traffic flows	Low	CTMP/ CWTP	Negligible
Queens Road - between A1173/ Kings Road and Queens Road/ Laporte Road	Traffic flow	Moderate	CTMP/ CWTP	Minor
Kings Road - between A1173/ Kings Road and Kings Road/ Pelham Road	Traffic flows	Negligible	CTMP/ CWTP	Negligible
Manby Road - between A160/ Manby Road and Kings Road/ Pelham Road	Traffic flows	Negligible	CTMP/ CWTP	Negligible
A160 - Between Manby Road/ A160 and A160/ A1077 Roundabout	Traffic flows	Negligible	CTMP/ CWTP	Negligible
A160 - Between A160/ A1077 Roundabout and A160/ A180	Traffic flows	Negligible	CTMP/ CWTP	Negligible

Receptor	Impact Pathway	Impact Magnitude	Mitigation Measure	Residual Effect
A180 W - Between A180/ A1173 and A180/ A160	Traffic flows	Negligible	CTMP/ CWTP	Negligible

11.8 Cumulative Effects

11.8.1 In relation to the cumulative effects of other nearby developments the only site that will be considered as part of the full ES is the adjacent IEERT site. See **Chapter 25: Cumulative and In-combination Effects** for further details of the assessment.

11.9 References

Ref 11-1 Institute of Environmental Assessment 'Guidelines for the Environmental Assessment of Road Traffic'. London: Institute of Environmental Assessment, 1993.

Ref 11-2 National Planning Policy Framework - Publications - GOV.UK, July 2021

Ref 11-3 National Planning Policy Framework - Publications - GOV.UK, February 2012

Ref 11-4 Travel Plans, Transport Assessments and Statements – Planning Practice Guidance (Department for Communities and Local Government, March 2014).

Ref 11-5 Standards for Highways, Design Manual for Road and Bridges (DMRB), CD 123 - Geometric design of at-grade priority and signal-controlled junctions, November 2021

Ref 11-6 NOMIS, Census to Work Data WU03EW - Location of usual residence and place of work by method of travel to work (MSOA level).

Ref 11-7 Department for Transport (2016). National Planning Statement for Ports (HMSO).

11.10 Abbreviations and Glossary of Terms

Table 11.17: Glossary and Abbreviations

Term	Acronym	Meaning
ATC	Automatic Traffic Count	Method of undertaking traffic surveys.
Affected Road Network	ARN	All roads that trigger the traffic screening criteria and adjoining roads within a certain distance.
Associated British Ports	ABP	One of the UK's leading and best-connected ports groups, owning and operating 21 ports across England, Wales and Scotland.
Automated Traffic Count	ATC	Automated Traffic Counts are a quick and inexpensive way of collecting, traffic volume, speed and classification.
AADT	Average Annual Daily Traffic	Amount of traffic that could be expected on a road during an average day throughout the year.
Construction Traffic Management Plan	CTMP	A plan which identifies clear controls on routes, vehicle types, vehicle frequency, vehicle quality and hours of site operation.
Construction Worker Travel Plan	CWTP	A plan to control the trips made by the construction workers (including encouraging car sharing) and thus reduce the impact of the workforce upon the highway network.
Design Manual for Roads and Bridges	DMRB	The Design Manual for Roads and Bridges contains information about current standards relating to the design, assessment and operation of motorway and all-purpose trunk roads in the United Kingdom.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
Guidelines for the Environmental Assessment of Road Traffic 1993	GEART	Guidance in relation to the impact thresholds related to development traffic.

Term	Acronym	Meaning
Heavy Goods Vehicle	HGV	A large truck for transporting goods.
Immingham Eastern Ro-Ro Terminal	IERRT	The proposed ro-ro facility.
Immingham GreenTerminal	IGT	A multi-user liquid bulk jetty, located on the eastern side of the Port of Immingham,
Institute of Environmental Management and Assessment	IEMA	A professional body for practitioners working in the fields of environmental management and assessment.
Manual Classified Count	MCC	Manual Classified Counts are used to conduct traffic flow surveys when it is not possible to use automatic methods. Enumerators will conduct these surveys. This can include but not be limited to junction counts, car park monitoring and origin and destination surveys.
Middle Layer Super Output Area	MSOA	Middle Layer Super Output Areas are a geographic hierarchy designed to improve the reporting of small area statistics in England and Wales.
National Cycle Network	NCN	The National Cycle Network is a UK-wide network of signed paths and routes for walking, cycling, wheeling and exploring the outdoors.
NH	National Highways	Highway Authority for the Strategic Road network, which in this location comprises the A160 and A180.
National Planning Policy Framework	NPPF	A planning framework which sets out the Government's planning policies for England and how these are expected to be applied.
National Policy Statement for Ports	NPSfP	The National Policy Statement for Ports provides the framework for decisions on proposals for new port development.
North East Lincolnshire Council	NELC	The site falls within the administrative boundary of the North East Lincolnshire Council.
Outline Construction Worker Travel Plan	OCWTP	An outline plan to control the trips made by the construction workers (including encouraging car sharing) and thus reduce the impact of the workforce upon the highway network and which the CWTP will be based upon.

Term	Acronym	Meaning
Preliminary Environmental Information	PEI	The information referred to in Part 1 of Schedule 4 of the EIA Regulations that has been reasonably compiled by the applicant and is reasonably required to assess the environmental effects of a project.
Public Rights of Way	PRoW	A highway where the public has the right to pass. It can be a footpath (used for walking), a bridleway (used for walking, riding a horse and cycling), or a byway that is open to all traffic (including motor vehicles).
Roll on-roll off	Ro-ro	A design to allow vehicles to drive on and drive off ships.
Trip End Model Presentation Program	TEMPRO	TEMPro is the industry standard tool for estimating traffic growth, which is required when assessing the traffic impact of a development on the local highway network. The model forecasts the growth in trip origin to destination up to 2051 for use in transport modelling taking into account: - Population; Employment;; Housing; Car Ownership; and Trip Rate

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 12: Marine Transport and Navigation

Associated British Ports

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Table of contents

Chapter Pages

Plates

Tables

12 Marine Transport and Navigation

12.1 Introduction

12.1.1 This chapter presents the baseline analysis and preliminary findings of the assessment of the impacts / risks of the Project on marine transport and navigation.

12.1.2 There may be interrelationships related to the potential effects on marine transport and navigation, and other disciplines. Therefore, also refer to the following chapter:

a. **Chapter 23: Socio-economics**.

12.1.3 This chapter is supported by the following figures (PEI Report, Volume III):

a. **Figure 12.1:** General Overview of Humber Estuary.

b. **Figure 12.2:** Detailed Overview of Site.

c. **Figure 12.3:** Vessel Tracks by Type.

d. **Figure 12.4:** Vessel Tracks (Tug).

e. **Figure 12.5:** Vessel Tracks (Dredger/Underwater Operations).

f. **Figure 12.6**: Vessel Tracks (Passenger).

g. **Figure 12.7:** Vessel Tracks (Cargo).

h. **Figure 12.8:** Vessel Tracks (Tanker).

i. **Figure 12.9** Vessel Tracks (Port Craft).

j. **Figure 12.10:** Vessel Tracks (Offshore Support).

k. **Figure 12.11:** Vessel Tracks (Recreational).

l. **Figure 12.12:** Vessel Outlines by Type.

m. **Figure 12.13:** Vessel Densities.

12.1.4 Relevant aspects of the marine transport and navigation baseline analysis presented in this chapter will be added to and expanded upon within the detailed Navigational Risk Assessment (NRA) which will be prepared and included as a Technical Appendix to the Environmental Statement (ES). During the course of the NRA, site visits will be undertaken, vessel simulations will be carried out, and a hazard review workshop will be held to engage with stakeholders. These will feed into the assessment of navigational safety. As these activities are yet to be carried out, this chapter is focused on summarising the baseline maritime activity, and identifying the hazards that will undergo risk assessment within the NRA / ES.

12.2 Approach to Assessment

Scope and Methods

12.2.1 A scoping exercise was undertaken in August 2022 to establish the form and nature of the marine transport and navigation assessment, and the approach and methods to be followed.

12.2.2 The Scoping Report (**Appendix 1.A** of the PEI Report, Volume IV) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on marine transport and navigation.

12.2.3 Following receipt of the Scoping Opinion (**Appendix 1.B** of the PEI Report, Volume IV) as to the information to be provided in the ES, the requirements set out in **Table 12.1** have been agreed with the Planning Inspectorate to be taken into account as part of the ongoing marine transport and navigation assessment:

Table 12.1: Scoping Opinion Comments on Marine Transport and Navigation

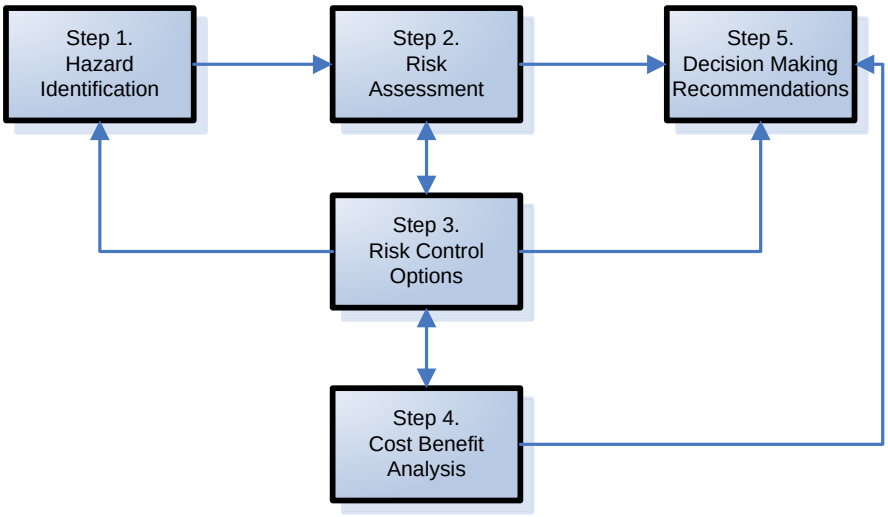
Consultee	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	The main data sources from which information would be obtained to inform the current and future marine transportation and navigational baseline should be agreed with relevant consultation bodies, where possible.	Standard data sources on vessel activity and historical maritime incidents have been presented in **Section 12.6**. Any other relevant data sources, such as on small vessel activity, will be identified during stakeholder consultation carried out as part of the NRA process.
	No details are provided on the assessment methodology to be used to determine likely significant effects, and this method should be clearly set out and justified based on evidence in the ES to demonstrate any conclusions reached.	**Section 12.2** describes the Formal Safety Assessment (FSA) approach that will be used in the NRA and ES.

12.2.4 Having regard to the information presented within the Scoping Report (**Appendix 1.A** of the PEI Report, Volume IV), no impacts were scoped out.

12.3 Assessment Method

12.3.1 A formal assessment of marine transport and navigational hazards / risks will be undertaken within the NRA / ES in line with the International Maritime Organization (IMO) FSA methodology and the Port Marine Safety Code. The methodology adopted is considered to be 'best practice' for port marine operations (see **Table 12.2**:) and is the preferred approach of the Maritime and Coastguard Agency (MCA) for NRA. An illustration of the FSA (Ref 12-1) approach is shown in **Plate 12-1**.

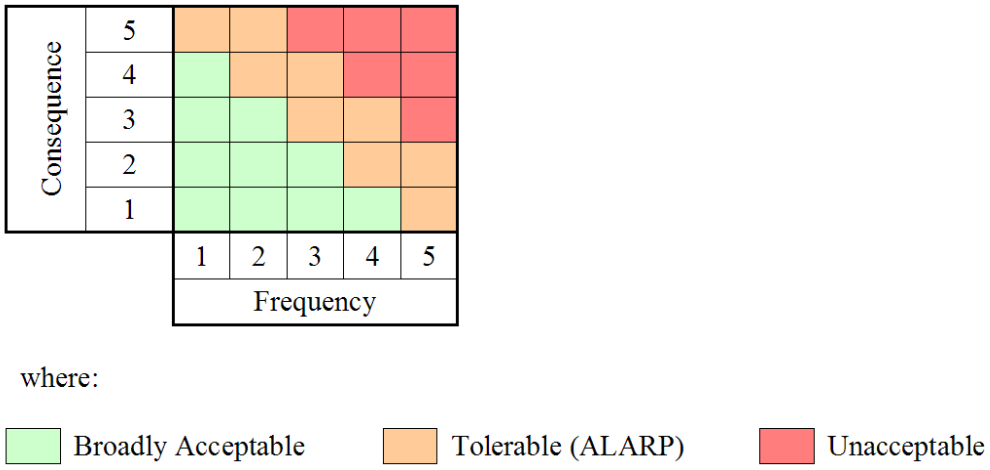
Plate 12-1: Overview of Formal Safety Assessment Process



12.3.2 Each hazard will be ranked in terms of frequency and consequence using appropriate definitions for the project. For each hazard, embedded mitigation in the form of existing safety measures in place at the Port, or planned for the Project, will be documented and taken into account within the ranking.

12.3.3 The overall risk ranking (frequency vs. consequence) will determine the hazard's position within the risk matrix shown in **Plate 12-2**.

Plate 12-2: Example Risk Matrix



12.3.4 The outcomes of the NRA will be reported in the ES. The overarching assessment methodology presented in **Chapter 5: EIA Approach** requires the determination of the magnitude of effect and sensitivity of receptor for each impact assessed. Within the FSA approach, the magnitude of the impact is captured within the severity of consequence ranking. The sensitivity of receptors is captured within the frequency of occurrence ranking. For the purposes of this assessment, impacts that are deemed to be unacceptable, or not within ALARP (As Low As Reasonably Practicable) parameters, are considered to be significant in EIA terms; impacts deemed to be broadly acceptable or tolerable and ALARP are deemed as not significant in EIA terms.

12.4 Legislation, Policy and Guidance

12.4.1 **Table 12.2**: presents the legislation, policy and guidance relevant to the Marine Transport and Navigation assessment and details how their requirements will be met in the assessment.

Table 12.2: Relevant legislation, policy and guidance regarding Marine Transport and Navigation

Legislation / Policy / Guidance	Consideration within the PEI Report
Department for Transport (DfT) Port Marine Safety Code, and relevant sections of the Guide to Good Practice (Ref 12-2)	
The Port Marine Safety Code sets out a national standard for every aspect of port marine safety. Its aim is to enhance safety for everyone who uses or works in the UK port marine environment. Although not mandatory, it is endorsed by the UK Government and representatives from across the maritime sector and, there is a strong expectation that all harbour authorities will comply. The Code is intended to be flexible enough that any size or	The guidance on risk assessment has been adopted to ensure all marine risks are consulted upon and formally assessed so that they can be eliminated or reduced to ALARP in accordance with good practice, and a marine safety management system (“MSMS”) implemented based on the risk assessment. This guidance has informed the identification of potential impacts and risks in **Section 12.3**.

Legislation / Policy / Guidance	Consideration within the PEI Report
type of harbour or marine facility will be able to apply its principles in a way that is appropriate and proportionate to local requirements.	
International Maritime Organization's (IMO) Revised Guidelines for Formal Safety Assessment (Ref 12-1)	
The Maritime Safety Committee, at its seventy-fourth session (30 May to 8 June 2001), and the Marine Environment Protection Committee, at its forty-seventh session (4 to 8 March 2002), approved the Guidelines for FSA for use in the IMO rule-making process. These have been amended several times with the latest being MSC-EPC.2/Circ.12/Rev.2, 9 April 2018	Provides a methodology for identifying and evaluating hazards / risks associated with marine operations, as well as appropriate mitigation measures, in a transparent and consistent manner. This guidance has informed the identification of potential impacts and risks in **Section 12.3**.
Maritime and Coastguard Agency's MGN 654 (M+F) Offshore Renewable Energy Installations (OREI) safety response, specifically Annex 1 regarding methodology as relevant to Port Developments (Ref 12-3)	
This Marine Guidance Note highlights issues that need to be taken into consideration when assessing the impact on navigational safety and emergency response (search and rescue, salvage and towing, and counter pollution) caused by offshore renewable energy installation developments in UK waters.	Although originally prepared for offshore renewables, it also provide useful guidance on the NRA approach to be adopted for any UK marine project, in particular, the specific guidance on the risk assessment methodology in Annex 1 which is aligned with IMO FSA. This guidance has informed the identification of potential impacts and risks in **Section 12.3**.

Stakeholder Engagement

12.4.2 A range of stakeholders, including the MCA and Trinity House Lighthouse Authority, have been engaged as part of the scoping process to obtain their views on the Project and the scope of the Marine Transport and Navigation assessment, the results of which are presented within the Scoping Opinion (**Appendix 1-B** of PEI Report, Volume IV). A meeting was held with representatives from Associated British Ports (ABP) Humber on 21st November 2022 to provide an overview of the Project and to discuss vessel traffic and key considerations for the NRA.

12.4.3 During the NRA, consultation is planned with ABP Humber personnel including Pilots, Harbour Master and Dock Master teams, other port users, e.g., operators of nearby Docks and Terminals, the Royal National Lifeboat Institution (RNLI), local sailing, and local fishing representatives. This will include a Hazard Review Workshop attended by a cross-section of stakeholders.

Limitations and Assumptions

12.4.4 The information presented in this preliminary assessment reflects that obtained and evaluated at the time of reporting, and is based on an emerging design for the Project and the maximum likely extents of marine works for its construction and operation.

12.4.5 A detailed NRA is currently being produced and the findings in this chapter are therefore limited to summarising the baseline maritime activity, and identifying the hazards that will undergo risk assessment within the NRA.

12.4.6 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further through the assessment and consultation processes, and as further research and vessel simulation exercises are completed to fully understand its potential effects.

12.4.7 The Automatic Identification System (AIS) vessel tracking data used in the baseline assessment does not fully cover all vessel movements, such as smaller fishing vessels and recreational vessels. Additional data sets (e.g., Port Callings Data and the RYA Coastal Atlas) will be explored during the NRA/ES.

12.5 Study Area

12.5.1 For this assessment, the study area covers all the area over which potential direct and indirect consequences of the Project are predicted to arise during the construction and operational periods.

12.5.2 The study area has been defined as the area comprising the Humber Estuary bounded on the west by the Humber Bridge and on the east by the Humber Estuary Services Statutory Harbour Authority (SHA) limit for the Humber Estuary. This study area encompasses the marine works associated with the Project, the main route to and from the Project location, and considers the total utilisation of the Humber Estuary to determine the implications on vessel traffic management.

12.5.3 **Figure 12.1** (PEI Report, Volume III) gives an overview of the study area.

12.5.4 **Figure 12.2** (PEI Report, Volume III) gives a zoomed-in view of the Project and key surrounding features.

12.5.5 The Project extends approximately 0.6nm from the southern side of the Humber. The remaining distance from the extremity of the Project to the northern side of the Humber is 1.3nm, but this reduces to 0.7nm if Foul Holme Sand is excluded. It is noted that the distance from the existing Immingham Oil Terminal (IOT) to Foul Holme Sand is 0.9nm.

12.6 Baseline Conditions

12.6.1 Current baseline conditions have been determined by a desk-based review of available information. The main desk-based sources of information that have been reviewed to inform the current baseline description within the vicinity of the Project include:

a. Automatic Identification System (AIS) data;

b. Marine accident/incident data; and

c. Information from nautical charts.

AIS data

12.6.2 Up to date AIS vessel tracking data has been used to characterise baseline marine traffic. The full dataset is comprised of the 12 months from 01 September 2021 to 31 August 2022, to cover seasonal variations. There was a small amount of downtime noted over the 12 months of approximately 3%.

12.6.3 AIS equipment (Class A) is required to be fitted on all vessels of 300 gross tonnage (GT) and upwards engaged on international voyages, cargo vessels of 500GT and upwards not engaged on international voyages, passenger vessels irrespective of size, built on or after 01 July 2002, and fishing vessels of 15m length and above. Smaller vessels (e.g., fishing vessels less than 15m in length and recreational craft) are not required to broadcast on AIS, but may do so voluntarily typically using Class B units. Both Class A and B vessels are included in the AIS dataset that has been used.

12.6.4 The AIS data have been analysed and divided into the following vessel categories:

a. Port service craft (e.g., pilot vessels, port tenders etc);
b. Vessels engaged in dredging or underwater operations;
c. Tugs;
d. Offshore support vessels (e.g., wind farm, oil and gas);
e. Passenger vessels;
f. Cargo vessels (e.g., general cargo vessels, ro-ro cargo vessels and bulk carriers etc);
g. Tankers (e.g., oil tankers, chemical tankers, and gas carriers);
h. Fishing;
i. Recreational; and
j. Unspecified/Other (e.g., military, patrol boats, survey vessels, lifeboats, etc).

Maritime accidents/incidents

12.6.5 To characterise maritime incidents occurring within the study area, available data have been analysed from the following three sources:

a. Royal National Lifeboat Institution (RNLI): complete dataset of all callouts from 2010 to 2019 inclusive;
b. Marine Accident Investigation Branch (MAIB): complete dataset from 2010 to 2019 inclusive; and
c. ABP Humber MarNIS (Port Risk Management software) incident data: complete dataset from 2012 to 2021 inclusive.

Admiralty Charts and Sailing Directions

12.6.6 Navigational features have been considered in this assessment and have been identified using information from UK Hydrographic Office (UKHO) Admiralty Charts 104, 3497 and 1188. These charts are used by mariners as part of the

passage planning process and to plot progress during a passage and so contain all relevant navigational information. More details can be found in the Admiralty Sailing Directions NP54 (12th edition 2021) issued by UKHO (Ref 12-4).

12.7 Navigational Baseline Information

12.7.1 The following sections review the baseline information for marine traffic and transport within the study area. The following elements are covered in the baseline:

a. Statutory responsibilities and management procedures;

b. Visual aids to navigation;

c. Vessel services;

d. Vessel traffic management;

e. Marine traffic analysis; and

f. Marine accidents and incidents.

Statutory responsibilities and management procedures

12.7.2 The Project, if consented, will be located fully within an extended Port of Immingham SHA area where the Applicant is the SHA. In this capacity, the Applicant is responsible with a set of powers and duties which include the management and regulation of the safety of navigation and marine operations in its SHA area.

12.7.3 Humber Estuary Services (HES), also run by ABP but as a separate statutory function, is the SHA for the wider Humber Estuary and Competent Harbour Authority (CHA) with respect to pilotage for the Humber Estuary and the ABP docks and other port facilities within the wider Estuary. As the CHA, HES has the power to issue Pilotage Directions that prescribe which vessels require a Pilot or Pilot Exemption Certificate (PEC) holder when navigating within the CHA area.

12.7.4 A Vessel Traffic Service (VTS) is provided for the Humber Estuary. Humber VTS maintains a vessel traffic picture through the AIS and Radar providing information on weather, vessel movements and marine safety to vessels navigating in the VTS area. All sea-going vessels are required to report to Humber VTS when entering and leaving the VTS area and at designated reporting points identified on navigational charts.

12.7.5 The Applicant is also the Local Lighthouse Authority (LLA) for the Port of Immingham's SHA area by virtue of the Merchant Shipping Act 1995. As LLA, the Applicant is responsible for the provision and maintenance of Aids to Navigation (AtoN). The Applicant is required to report any defects to AtoN and consult on any proposed changes, additions or removal of AtoN with Trinity House Lighthouse Authority as the General Lighthouse Authority for England and Wales.

12.7.6 Both the Port of Immingham and HES have committed to meeting the requirements of the Port Marine Safety Code (PMSC). The PMSC requires that ports operate a Marine Safety Management System (MSMS) which is based on a comprehensive and a continuously updated set of risk assessments. The MSMS

details how the ports fulfil their duties as SHAs and meet the marine safety requirements prescribed by the PMSC.

Visual Aids to Navigation

12.7.7 Visual aids to navigation within the study area conform to the standards of the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) and Trinity House.

12.7.8 Lateral markers are used to denote the navigable section of the estuary, the main navigable channel, and smaller channel, Foul Holme Channel. Leading lights are positioned on the Immingham Bulk Terminal identifying the main channel for transiting vessels.

12.7.9 A number of aids to navigation are surrounding the facilities nearby which include channel lights denoting the terminals and edge of the channel particularly noticeable on the Oil Terminal and Immingham Bulk Terminal.

Vessel Services

12.7.10 Pilotage in the Humber Estuary and the Port of Immingham is provided by HES. Pilotage Directions define the Humber Pilotage Area and the requirements for compulsory pilotage within it (Ref 12-5). The directions also lay down regulations under which Pilotage Exemption Certificates (PECs) are issued and administered in the area.

12.7.11 Vessels subject to compulsory pilotage within the compulsory pilotage area include:

a. All vessels of greater than 60m length;

b. Any vessel less than 60m carrying a bulk cargo of dangerous substances as defined and categorised in the Dangerous Substances in Harbour Areas Regulations (Ref 12-6); and

c. Vessels over 100m moving between tidal estuary berths which includes the moving of mooring lines.

12.7.12 Towage is provided by a range of service providers with the main companies being SMS Towage and Svitzer who offer a range of tugs with different bollard pull capacities.

12.7.13 The vessel's size, type and draught dictate the minimum tugs that are required. Of particular note for the study area, all tankers visiting IOT up to 150,000 Dead Weight Tonnage (DWT) and gas tankers over 20,000 DWT require two tugs from the Sunk Spit Buoy for the passage to the berth.

12.7.14 Tankers up to 50,000 DWT require three tugs for berthing, four tugs are required for berthing tankers 50,000 to 150,000 DWT and five for any vessels greater than 150,000 DWT.

12.7.15 Vessels visiting the IOT Finger Pier shall be accompanied by the tug which is on standby at the pier.

Vessel Traffic Management

12.7.16 A Vessel Traffic Service (VTS), which is located at the Humber Marine Control Centre (HMCC) in Grimsby, operates a 24-hour service for all river users. This service operates as a Traffic Organisation Service (TOS) and an Information Service. The objectives of VTS are safe use of the waterway, efficiency of traffic movement, and protection of the marine and adjacent environment. The system is compulsory for all sea-going vessels when entering the Humber VTS area.

12.7.17 The service provides AIS coverage throughout the VTS area and radar tracking within the area bounded by the Humber Bridge and the seaward limits of the VTS area. In addition, every two hours the VTS service broadcasts information to mariners regarding the weather, tidal information and navigational warnings.

DFT Port Statistics

12.7.18 Statistics published by the DFT indicate that the Humber Estuary is one of the busiest waterways in the UK with the main Humber Ports of Hull, Goole, Grimsby and Immingham accounting for the majority of cargo handled on the River Humber. Grimsby and Immingham handled just over 50 million tonnes of freight cargo in 2021, second only to London in the UK. The Port of Hull handles nearly 10 million tonnes of cargo per year and Goole around 2 million tonnes.

Marine Traffic Analysis

12.7.19 This section presents a summary of the analysis of vessel traffic in the study area based on a full-year AIS dataset (01 September 2021 to 31 August 2022). There was an average of 158 unique vessels recorded per day within the study area.

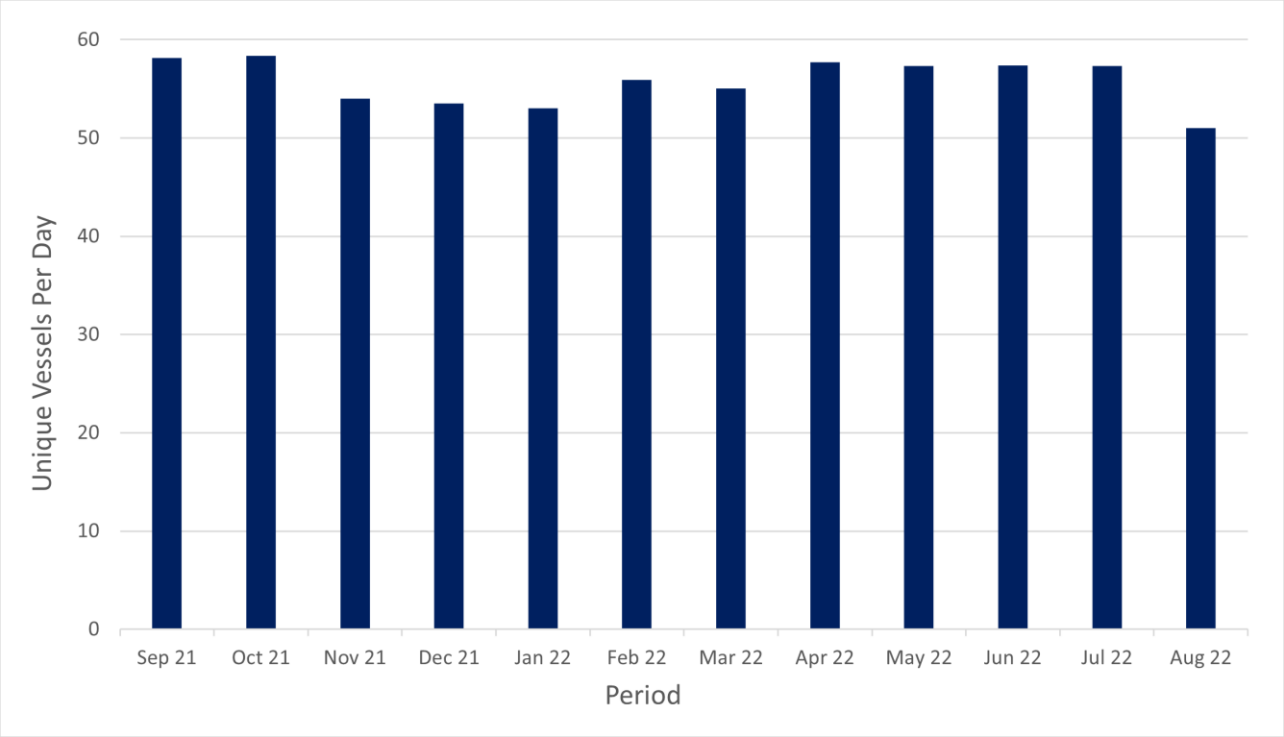
12.7.20 A more detailed analysis has been undertaken for all the AIS vessel transits passing through a gate drawn across the river at the point of the Project. There was an average of 56 unique vessels recorded per day intersecting the gate.

12.7.21 **Figure 12.3** (PEI Report, Volume III) shows all the vessel tracks intersecting the gate over 12 months, colour-coded by vessel type.

12.7.22 It can be seen that the Project is in a stretch of the river which is transited by a range of vessels including port service craft (pilot boats, survey, line handling vessels etc), tankers, tugs and vessels engaged in dredging or underwater operations. A large number of vessel transits are to/from the Finger berth at IOT which is used regularly by tankers. There is also a significant number of vessel transits shown at the East Jetty which is regularly used as a tug berth and also has infrastructure for product tankers to load/discharge.

12.7.23 **Plate 12-3** shows a count of the AIS transits passing through the gate. The vessel count is based on the total number of unique vessels (i.e., unique MMSIs) recorded per day, during the study period.

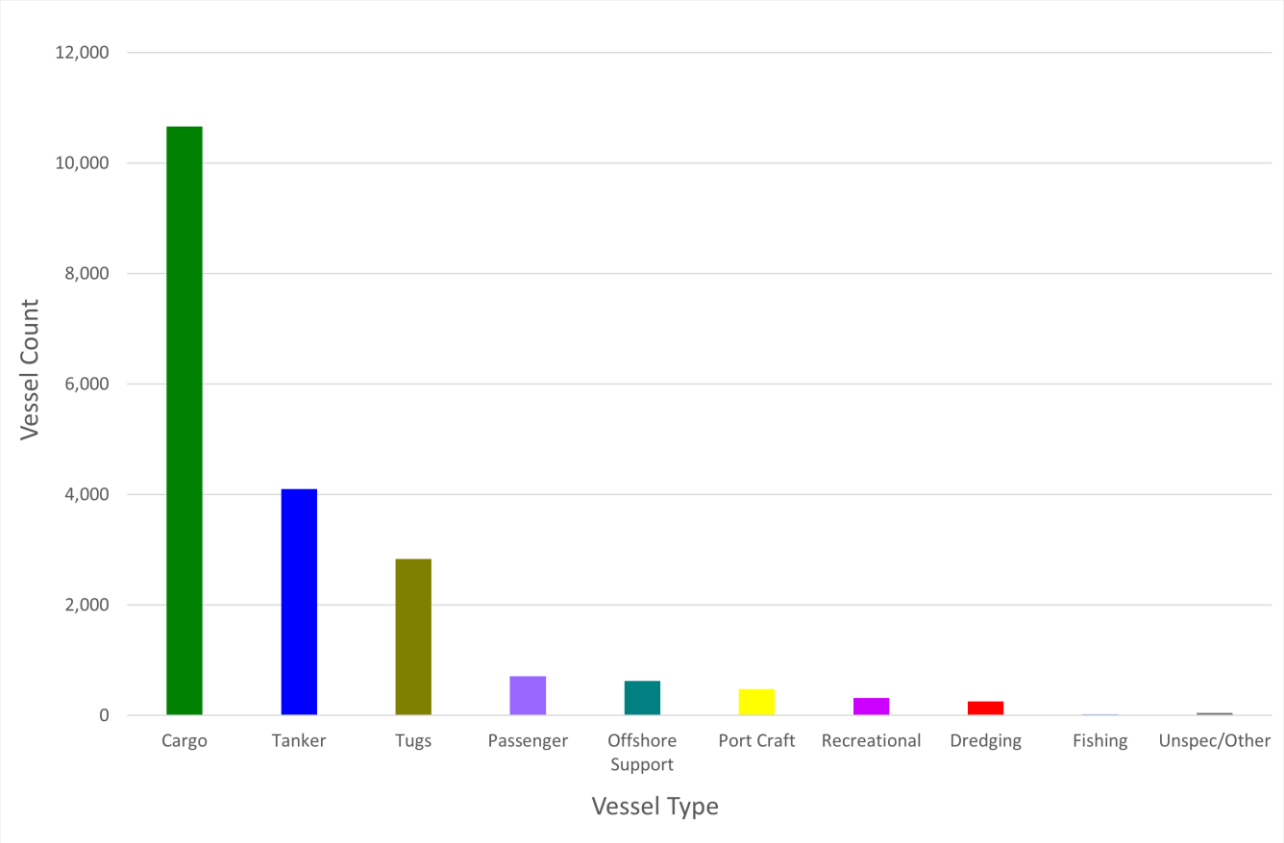
Plate 12-3: Unique Vessels Per Day



12.7.24 It can be seen that the vessel count was relatively consistent, with October 2021 being the busiest month and August 2022 being the least busy.

12.7.25 **Plate 12-4** shows the distribution of AIS transits by vessel type.

Plate 12-4: Vessel Type Distribution



12.7.26 Cargo vessels accounted for 53% of the overall distribution, followed by tankers (20%), and tugs (14%). Fishing and Unspecified/Other vessels accounted for less than 1% of the overall distribution, although it should be noted that these vessels may be under-represented in AIS data. Other data sources will be researched during the NRA, as well as consultation with local experts, to identify the extent of non-AIS traffic in the NRA / ES.

12.7.27 **Figure 12.4** to **Figure 12.10** (PEI Report, Volume III) identify the vessel movements for each type representing over 1% of the total traffic during the 12-month study period. (It is noted that small time gaps between positions being received can occasionally give the appearance of a vessel crossing land or a jetty but this does not affect the analysis).

Recreational navigation

12.7.28 The Humber Estuary has approximately 1,000 permanent berths and 120 visitor berths for recreational craft. The majority of recreational activity occurs during the summer months and predominantly on the weekend. There are no recreational facilities based at the Port of Immingham.

12.7.29 Established recreational vessel destinations in the Humber Estuary include: Hull Marina which has accommodation for 310 boats and 20 visitors; Goole Boathouse which offers 140 moorings and South Ferriby marina which provides accommodation for 100 boats plus 20 visiting vessels. In addition, there are

various creeks around the estuary providing further capacity, namely Tetney Haven (Humber Mouth Yacht Club) where small numbers of moorings are available, Stone Creek (located on the north side of the river opposite Immingham), Hessle Haven and Barrow Haven, which both provide anchorages.

12.7.30 **Figure 12.11** (PEI Report, Volume III) shows the recreational transits through the area from AIS data, which represented 1.6% of all vessel movements. It is noted that it is not compulsory for recreational vessels to broadcast on AIS, and therefore, numbers may be under-estimated.

12.7.31 During the 12-month study period, recreational activity peaked during the summer months of July and August, with a record of two vessels per day during each month. The quietest month was February with one unique vessel every nine days, followed by December with one unique vessel every four days.

Vessel Transits relative to the Project

12.7.32 A sample of vessels transiting the river in the vicinity of the Project is presented in **Figure 12.12** (PEI Report, Volume III) based on the vessel positions and dimensions broadcast on AIS. The vessels are shown to scale for a seven-hour period on the 14 August 2022.

12.7.33 Two vessels, a cargo vessel and a tanker, were recorded crossing the Project during this period. A number of other vessels passed to the north, including a passenger vessel.

12.7.34 Further analysis will be undertaken using the wider AIS data set to inform the assessment of the available sea room and potential changes to vessel-to-vessel encounters when there are vessels at the Project.

Vessel Densities

12.7.35 This section presents a vessel density plot (heat map) based on the year of AIS tracks intersecting a grid of cells encompassing the Project.

12.7.36 The density grid for the 12 month AIS dataset is presented in **Figure 12.13** (PEI Report, Volume III). It represents a vessel density heat map based upon the number of AIS tracks intersecting 100m x 100m grid cells.

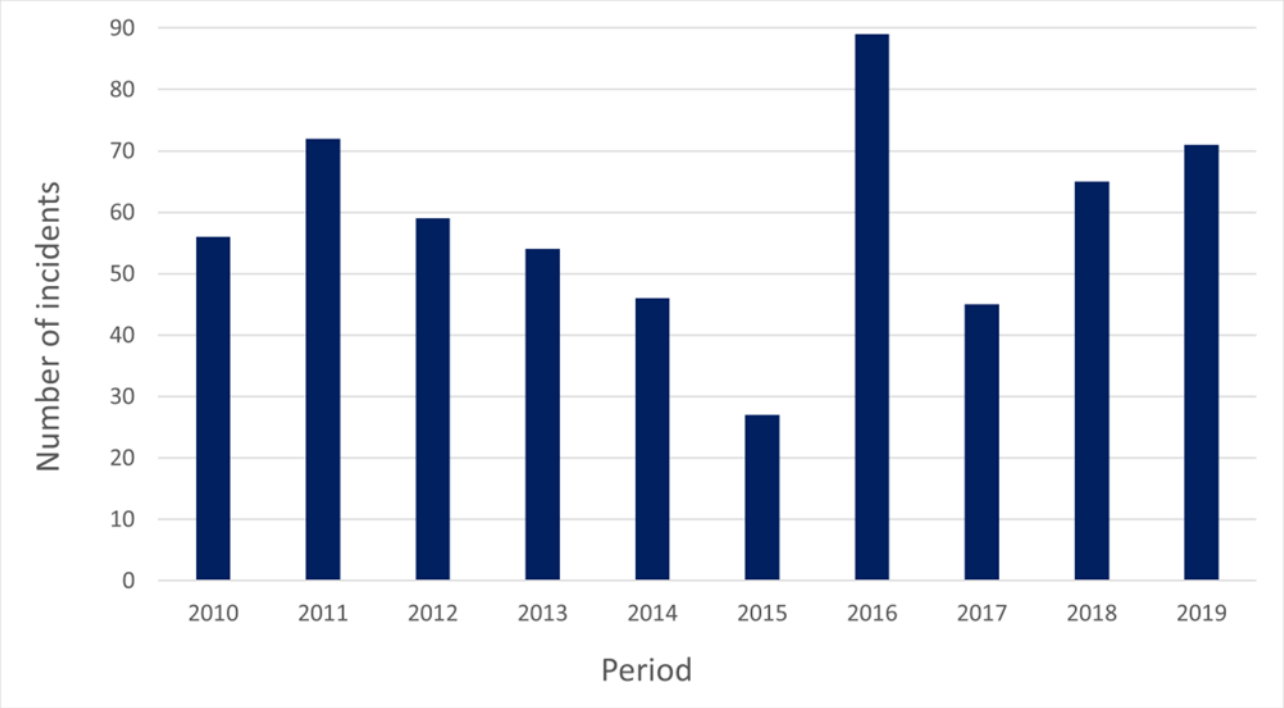
12.7.37 A high-density route was observed crossing the northern (outer) edge of the site boundary used by vessels to / from Immingham. The inner part of the site boundary had limited existing traffic crossing it.

Historical Maritime Incidents

12.7.38 This section presents a summary of the maritime incidents within the study area based on three sources:– RNLI, MAIB and MarNIS (ABP Humber). It should be noted the reporting requirements and time period differ per source, although 10 years of data have been reviewed in each case. A more in-depth analysis will be undertaken for the NRA / ES using the latest available data sets.

a. **RNLI** (2010 to 2019 inclusive): **Plate 12-5** shows a summary of yearly fluctuations within the study area, based on RNLI data.

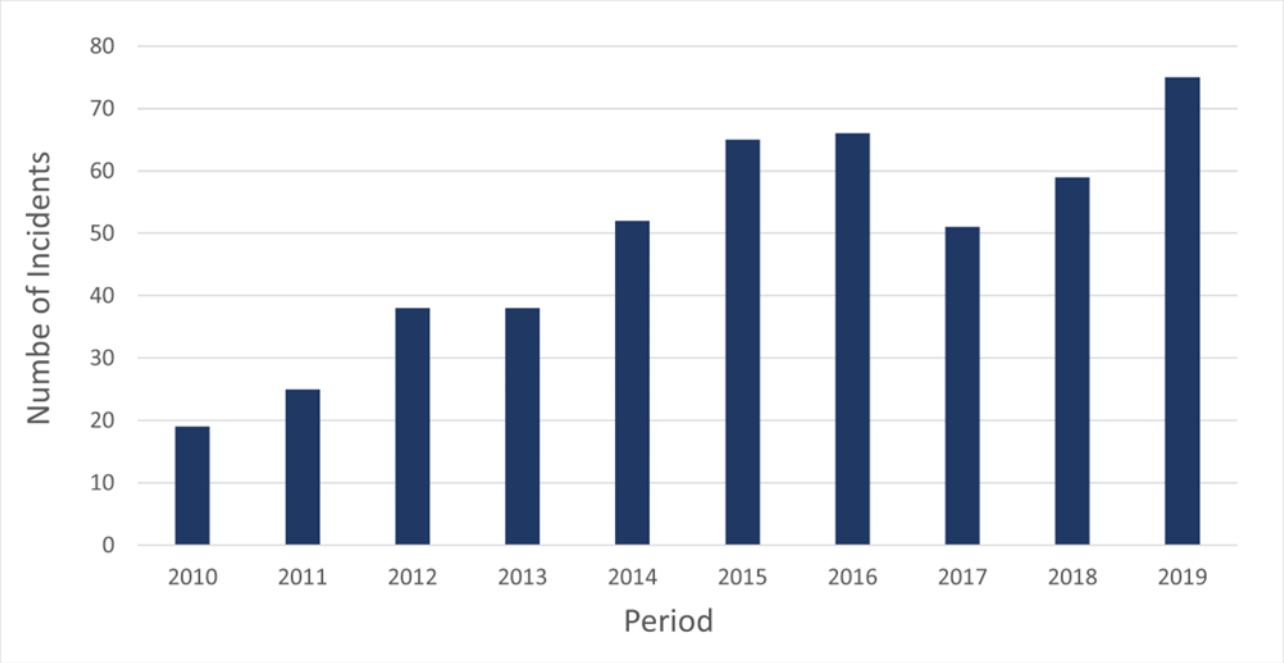
Plate 12-5: Number of Incidents based on RNLI Data



12.7.39 An average of 58 incidents per year were recorded by the RNLI. Most of the recorded incidents were due to equipment failure, grounding, sailing failure (recreational activity) and collision. The incidents that were recorded in proximity to the Project were responded to by the Humber Lifeboat Station. The Cleethorpes station was also involved in responses to incidents farther east, near Grimsby.

a. **MAIB** (2010 to 2019 inclusive): **Plate 12-6** shows a summary of yearly fluctuations within the study area, based on the MAIB data.

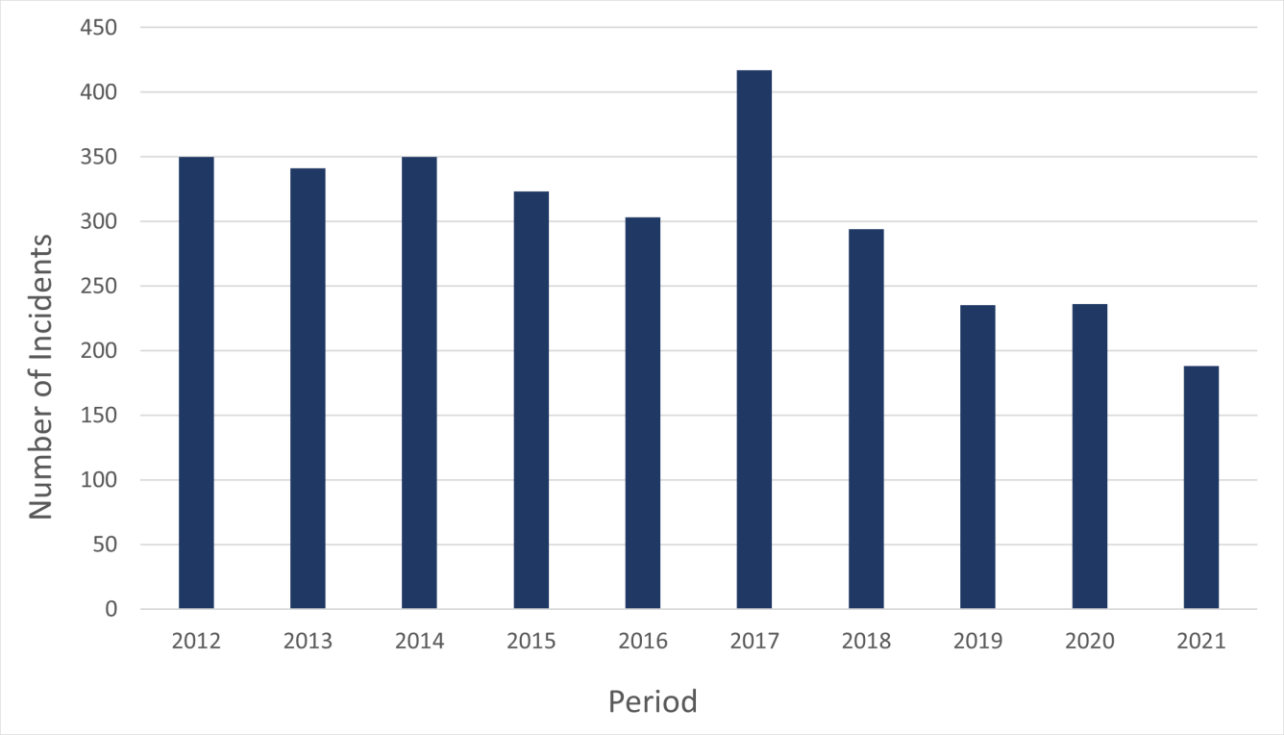
Plate 12-6: Number of Incidents based on MAIB Data



12.7.40 An average of 49 incidents per year were recorded by the MAIB. Most of the recorded incidents were due to grounding, equipment failure, collision with port infrastructure and loss of control. Collisions were more commonly noted in close proximity of the ports; Hull, Grimsby and Immingham.

a. **MarNIS** (2012 to 2021 inclusive): **Plate 12-7** shows a summary of yearly fluctuations within the study area, based on the MarNIS data.

Plate 12-7: Number of Incidents based on MarNIS Data



12.7.41 An average of 304 incidents per year were recorded by the MarNIS. Most of the recorded incidents were due to equipment failure, and collision with third-party vessels and port infrastructure. It is noted that the number of incidents recorded in MarNIS is much higher due to reporting requirements, including near misses being logged.

12.7.42 **Table 12.3** summarises the six MArNIS incidents recorded in the past 10 years within the marine boundary of the Project.

Table 12.3: Incidents within the marine boundary of the Project

ID	Date	Category of Incident
1	24/05/2013	Grounding
2	23/10/2013	Suspicious floating object
3	24/02/2017	Damaged cargo
4	26/04/2018	Equipment failure (vessel)
5	01/04/2021	Striking with ship (moored)
6	20/07/2021	Equipment failure (vessel)

Future Baseline

12.7.43 In the absence of the Project there is unlikely to be significant changes to commercial and recreational navigation at the Port of Immingham. The current usage of the marine terminals will likely remain consistent with any changes resulting from national and international changes to demand.

12.7.44 Cumulative impacts on commercial and recreational navigation could arise as a result of other coastal and marine developments and activities in the Humber Estuary. These will be considered as necessary as part of the cumulative impacts and in-combination effects assessment, the approach to which is explained further in **Chapter 25: Cumulative Effects and In-Combination Assessment**. The assessment of cumulative effects will be reviewed and updated as relevant as part of the ES.

12.8 Design, Mitigation and Enhancement Measures

Embedded Mitigation Measures

12.8.1 The Project has been designed, as far as possible, to avoid and minimise impacts and effects to marine transport and navigation through the process of design development, and by embedding mitigation measures into the design.

Standard Mitigation Measures

12.8.2 Standard industry mitigation measures will be followed which are appropriate to the construction and operational activities being undertaken. A preliminary list of such measures (non-exhaustive) is provided below:

a. **Update arrival/sailing parameters**: The new berth shall have updated local instructions on the requirements for arrival/sailing planning for the vessels visiting the area, including requirements for pilot and tug support;

b. **Communications between project team and port**: Discussion of upcoming activities shall take place with the personnel at Immingham, HES and where relevant, the Pilots;

c. **Contractor risk assessment method statement (RAMS)**: Contractors shall have RAMS covering all of the construction activities which shall be reviewed by the Harbour Authority prior to the commencement of activities;

d. **Weather limits**: The maximum weather limits for operations shall be assessed and set for all activities. These shall be monitored against real time and forecasted weather conditions throughout the construction process. In addition, operational weather limits shall also be considered for vessels using the terminal during the operational phase;

e. **Monitoring of wind/wave conditions**: Weather forecasting and monitoring shall be carried out and compared with the allowable weather limits for reliable planning and assessment of risk regarding the weather operating limits, which will vary between phases and activities, e.g., construction versus normal operation;

f. **AIS equipment**: All construction craft including barges shall have AIS transmitters;

g. **Designated point of contact**: For the construction activities to provide appropriate information and respond to emergency situations. This role shall be the main line of communication between the works and the SHA;

h. **Safety boat**: Ready and on standby during construction activities. The availability of a safety boat in the area of marine works shall provide for rapid response to emergency situations and an overview of the activity being conducted;

i. **Availability of pollution response equipment**: Construction contractors shall have tier 1 oil spill response equipment to ensure any pollution events can be contained;

j. **Aids to navigation, Provision & maintenance of**: The marine works shall be appropriately lit as soon as there are items which pose a hazard to navigation. Once operational, aids to navigation shall be provided and maintained so that the structure and berths can be identified;

k. **Hydrographic surveying program**: The current programme of surveying at the Port of Immingham shall be updated to include the Project. The results of the survey shall be provided to the UKHO for use in navigational charts and compared with previous surveys to inform potential requirements for maintenance dredging;

l. **Dropped items procedure**: During the construction there is potential for items to be dropped in the water and cause a risk to navigation. The contractors shall have a procedure agreed with the SHA for actions to be taken if a large item is dropped during the construction phase;

m. **Loading/unloading plan**: Equipment and materials being delivered by barge shall have plans specifying the order and method of loading and unloading at the marine works site;

n. **Update Admiralty List of Radio Signal (ALRS), Sailing Directions and UKHO Charts**: With new infrastructure put in place, relevant sailing publications shall be updated as they are used by vessels during passage planning;

o. **Mooring studies and plans**: A mooring study shall be completed for the proposed mooring arrangements at the berth to confirm that there is appropriate restraint available to restrain the vessel for the operational wind limits and the expected tidal flows;

p. **Shore side facility maintenance programme**: A regular program of maintenance for infrastructure including mooring bollards/hooks, shall be implemented to ensure that the facility is maintained and fit for use;

q. **Pilotage**: Given the size of the tankers, they will have pilotage in conformance with the HES Pilotage Directions; and

r. **Towage**: Towage support suitable for the size of the tanker will be provided by tugs from the Sunk Spit Buoy for the passage to the berth.

12.8.3 During the formal risk assessment process carried out as part of the NRA, more detailed mitigations will be identified and assessed, including at the Hazard Review workshop involving local stakeholders.

12.9 Potential Impacts and Effects

12.9.1 This section identifies the potential impacts on the marine transport and navigation users as a result of the construction and subsequent operation of the Project which have been identified at this preliminary stage. It should be noted that the construction of the Project may be completed in a single stage, or it may be sequenced such that the construction of Berth 2 takes place at the same time as operation of Berth 1 (see **Chapter 2: The Project**). However, all capital dredging (and associated disposal activity) will be undertaken together at one time, before operation of Berth 1 commences.

12.9.2 An assessment of these impacts, and any others identified during the course of the assessment work, will be undertaken and reported in the NRA and ES.

Construction

12.9.3 The following potential impacts/risks have been identified for the construction phase of the Project:

a. Contact of works craft with Port infrastructure: manoeuvring of craft in close proximity to marine structures has the potential for contact with infrastructure during site development;

b. Contact of commercial vessel with marine works: tanker on passage to/from the IOT has the potential to make contact with the marine works;

c. Collision of passing vessels with works craft: as passing vessels (commercial, recreational or fishing) are manoeuvring around or in close proximity to the works there is the potential for collision with craft associated with the Project;

d. Collision during navigation: vessel collision (commercial, recreational or fishing) with works craft whilst transiting to/from the Project or during activities within the disposal site (if required);

e. Collision during towage operations: if materials for Project are transported through the use of barges, there is potential for collision with commercial or recreational vessels in the area;

f. Increased collision risk between third-party vessels due to displacement away from the Project (including any marshalling area);

g. Increased grounding risk of third-party vessels due to displacement away from the Project (including any marshalling area); and

h. Payload related incidents: if lifting operations are required from barges/vessels associated with the Project, there is potential for incidents to arise from dropped items or affected vessel stability.

Operation

12.9.4 The following potential impacts have been identified for the operational phase of the Project:

a. Collision due to increased commercial vessel movements: vessels transiting within the Project area in collision with other Port traffic (commercial, dredging, recreational or fishing);

b. Collision due to increased maintenance dredging movements: dredging vessels on transit to/from the dredge pocket or during dispersal operations in collision with other marine traffic (commercial, recreational or fishing);

c. Collision with passing traffic: vessels manoeuvring at the berth in collision with passing traffic (commercial, recreational or fishing);

d. Contact with mooring infrastructure: manoeuvring vessel, dredging vessel or tug in contact with the jetty as a result of collision avoidance, adverse weather, nature of the operation or interaction with a passing vessel;

e. Mooring breakout with vessel alongside: there is potential for a vessel to break its moorings and to leave the berth due to stress of weather, passing vessels or mooring equipment failure;

f. Increased collision risk between other Port vessels due to displacement caused by the Project; and

g. Increased grounding risk for other Port vessels due to displacement caused by the Project.

Decommissioning

12.9.5 The DCO Application will not make any provision for the decommissioning of the marine infrastructure above and below water level. This is because the Project will, once constructed, become part of the fabric of the Immingham port estate and will, in simple terms, continue to be maintained so that it can be used for port related activities to meet a long-term need. On this basis, potential effects on marine transport and navigation from decommissioning have been scoped out.

12.10 Summary and Next Steps

12.10.1 This chapter has analysed the baseline marine transport and navigational features of the area, identified potential risks as well as standard mitigation measures to control these risks.

12.10.2 The next step in the process will be to undertake a detailed NRA which will be prepared and included as a Technical Appendix to the ES.

12.10.3 As part of the NRA, site visits will be undertaken to discuss the project with harbour personnel, simulations will be run of tankers moving to and from the IGET berths in different weather and tidal conditions, and a hazard review workshop will be held to engage with a wider cross-section of navigational stakeholders. These will inform the assessment of navigational safety to ensure all residual navigational risks are broadly acceptable or tolerable with mitigation, i.e., ALARP, which means they are not significant from an EIA perspective. If any

risks are initially assessed to be unacceptable (significant), the FSA approach will be followed, as illustrated in **Plate 12-1**, whereby additional risk controls will be identified and applied using an iterative process until the residual risk is made tolerable with mitigation (ALARP).

12.10.4 The outcomes of the NRA will be reported in the ES.

12.11 References

Ref 12-1 International Maritime Organization (2018). Revised guidelines for Formal Safety Assessment (FSA) for use in the IMO rule-making process.

Ref 12-2 Department for Transport, Maritime & Coastguard Agency (2016). *Port Marine Safety Code.*

Ref 12-3 Maritime & Coastguard Agency (2021). MGN 654 Annex 1 Methodology for assessing marine navigational safety & emergency response risks of OREIs (Version 3).

Ref 12-4 UK Hydrographic Office (2021). *Admiralty Sailing Directions* NP54 (12th edition).

Ref 12-5 Associated British Ports (2016). Pilotage Directions for ships to be navigated within the Humber pilotage area.

Ref 12-6 UK Legislation (2016). The Dangerous Goods in Harbour Areas Regulations 2016.

12.12 Abbreviations and Glossary of Terms

Table 12.4: Glossary and Abbreviations

Term	Acronym	Definition
Associated British Ports	ABP	One of the UK's leading and best connect ports groups, owning and operating 21 ports and other transport-related businesses across England, Wales and Scotland.
Automatic Identification System	AIS	This is an automatic tracking system that uses transceivers on ships and is used by vessel traffic services. It transmits a ship's position, identity, course and speed.
As Low As Reasonably Practicable	ALARP	This is a principle in the regulation and management of safety-critical and safety-involved systems. The principle is that the residual risk shall be reduced as far as reasonably practicable.
Admiralty List of Radio Signals	ALRS	This provides information on all aspects of Maritime Radio Communications, helping bridge crews to manage communications and comply with all reporting regulations throughout a voyage.
Aids to Navigation	AtoN	This is any type of signal, marker, or guidance device that aids the mariner in navigation.
Competent Harbour Authority	CHA	This includes the harbour authorities that have been given statutory powers relating to the provision of pilotage in their waters.
Department for Transport	DfT	This is a ministerial department responsible for the UK transport network including roads, railways, sea and air transport.
Dead Weight Tonnage	DWT	This is a measure of how much weight a ship can carry. It is the sum of weights of cargo, fuel, water, provisions, passengers and crew.
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
European Union	EU	This is a supranational political and economic union of 27 member states that are located primarily in Europe.
Formal Safety Assessment	FSA	This is a rational and systematic process for assessing the risks associated with shipping activity and for evaluating the costs and benefits of IMO's options for reducing these risks.

Term	Acronym	Definition
Humber Estuary Services	HES	The main role of HES is to provide safe navigation for all craft sailing within the confines of ABP-HES harbour jurisdiction and to provide an efficient pilotage service under its remit as Statutory and Competent Harbour Authority.
International Association of Marine AtoN and Lighthouse Authorities	IALA	This is an international organization responsible for collecting and providing nautical expertise and advice.
International Maritime Organization	IMO	IMO is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships.
Immingham Oil Terminal	IOT	This is an oil terminal located within Immingham Port consisting of four berths, mostly visited by oil and chemical tankers.
Local Lighthouse Authority	LLA	This is a port, harbour, or other party providing navigational aids in a locality as part of its facilities. It has authority over local AtoN in its area.
Marine Accident Investigation Branch	MAIB	This investigates marine accidents involving UK vessels worldwide and all vessels in UK territorial waters.
MarNIS	-	A Port Risk Management software package designed to help the professional mariner, harbour master and port safety officer to meet and exceed industry standards.
Maritime and Coastguard Agency	MCA	This is an executive agency of the UK that is responsible for implementing British and international maritime law and safety policy.
Marine Guidance Note	MGN	MGNs give guidance and recommendations about best practice to industry on interpretation of law and general safety advice.
Marine Safety Management System	MSMS	This is a set of organizational accountabilities, policies and procedures that collectively seek to assure safe and efficient operations.
Navigational Risk Assessment	NRA	A Navigational Risk Assessment identifies and assesses the hazards and risks affecting vessel navigation.
Offshore Renewable Energy Installations	OREI	OREI comprises of any structures and installations associated with the renewables: marine (wave and tidal energy) and offshore wind.
Pilot Exemption Certificate	PEC	This is a document issued by the CHA by which an exemption from or modification of compulsory pilotage is granted.

Term	Acronym	Definition
Port Marine Safety Code	PMSC	This is a safety code for harbour authorities with statutory powers and duties in the UK and sets out a national standard for port marine safety.
Royal National Lifeboat Institution	RNLI	This is a British charity that provides 24-hour lifeboat search and rescue, and a seasonal lifeguard service.
Risk Assessment Method Statement	RAMS	This is an important health and safety document that is completed to identify the steps to be undertaken to carry out a specific activity or task in a safe manner.
Statutory Harbour Authority	SHA	A statutory body responsible for the management and running of a harbour. The powers and duties in relation to a harbour are set out in either local Acts of Parliament or a Harbour Order.
Traffic Organisation Service	TOS	This is a service to prevent the development of dangerous maritime traffic situations and to provide for the safe and efficient movement of vessel traffic within the VTS Area.
United Kingdom	UK	The UK, made up of England, Scotland, Wales and Northern Ireland, is an island nation in northwestern Europe.
UK Hydrographic Office	UKHO	This is the UK's agency for providing hydrographic and marine geospatial data to mariners and maritime organisations across the world.
Vessel Traffic Service	VTS	This is a service implemented by CHA to improve the safety and efficiency of vessel traffic and to protect the environment.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 13: Landscape and Visual Impact

Associated British Ports

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Table of contents

Tables

13 Landscape and Visual Impact

13.1 Introduction

13.1.1 This chapter presents the preliminary findings of the assessment of the likely effects of the Project on landscape/ seascape character (as a resource in its own right) and visual amenity.

13.1.2 There may be interrelationships related to the potential effects on landscape and visual impacts and other disciplines. Therefore, also refer to the following chapters:

a. **Chapter 8: Terrestrial Ecology**

13.1.3 This chapter is supported by the following figures and appendices:

Figures

a. **Figure 13.1**: Project Location and Study Area (PEI Report, Volume III).
b. **Figure 13.2:** Zone of Theoretical Visibility – Bare Earth (PEI Report, Volume III).
c. **Figure 13.3**: Zone of Theoretical Visibility – Visual Screening (PEI Report, Volume III).
d. **Figure 13.4**: Landscape Character Areas – National and Regional (PEI Report, Volume III).
e. **Figure 13.5**: Landscape Character Areas – Local (PEI Report, Volume III).
f. **Figure 13.6**: Designations (PEI Report, Volume III).
g. **Figure 13.7**: Viewpoint Locations (PEI Report, Volume III).
h. **Figure 13.8.1 - 13.8.10:** Viewpoint Photographs (PEI Report, Volume III).

Appendix

a. **Appendix 13.A** Landscape and Visual Proposed Methodology (PEI Report, Volume IV)

13.2 Approach to Assessment

Scope and Methods

13.2.1 A scoping exercise was undertaken in August 2022 to establish the form and nature of the landscape/ seascape and visual impact assessment, and the approach and methods to be followed.

13.2.2 The Scoping Report (**Appendix 1.A** of PEI Report Volume IV) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on landscape/ seascape character and visual amenity.

13.2.3 Having regard to the information presented within the Scoping Report (**Appendix 1.A** of PEI Report Volume IV), the Planning Inspectorate's Scoping Opinion

(**Appendix 1.B** of the PEI Report Volume IV) states that the Planning Inspectorate disagrees that significant effects on landscape character and visual amenity during operation are unlikely. Accordingly, this matter is to be scoped back in for consideration in the Environmental Statement (ES); therefore, there are no identified elements to be scoped out of the assessment on landscape and visual impact.

13.2.4 **Table 13.1** summarises the consultation undertaken to date for landscape and visual impact, as well as where comments have been addressed within the chapter.

Table 13.1: Scoping Opinion comments on landscape/ seascape and visual impact assessment

Consultee	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	The Scoping Report seeks to scope out this matter on the grounds that because of the existing industrial character of the area and the immediate surrounding area, landscape and seascape effects during the operational phase would be insignificant. The Inspectorate does not agree that this matter can be scoped out of further assessment and advises the Applicant to provide a comprehensive project description in the ES which includes the maximum dimensions of all the structures associated with the Proposed Development and visual representations to give the Examining Authority confidence that no significant environmental effects would arise.	Noted: will be included within the assessment
	Design measures to reduce the landscape and visual impacts of the Proposed Development are to be considered, such as lighting design. The ES should include a night-time character assessment prepared in co-ordination with a lighting assessment, demonstrating how the lighting design has been developed to minimise impacts.	A lighting assessment will be undertaken and included in the ES.
	The ES should include photomontages from representative viewpoints to support the visual impact assessment, including from Immingham Town. Photomontages should be prepared in line with relevant Landscape Institute guidance and viewpoints should be agreed with consultation bodies where possible.	Noted: Consultation will be undertaken to identify viewpoints. Photomontages will be prepared and included in the ES.
Natural England	Natural England would wish to see details of local landscape character areas mapped at a scale appropriate to the development site as well as any relevant management plans or strategies pertaining to the area. The EIA should include assessments of visual effects on the surrounding area and landscape together with any physical effects of the development, such as changes in topography.	Noted. This will be included in the landscape and visual assessment of the ES.

Consultee	Summary of Response	How comments have been addressed in this chapter
	The England Coast Path (ECP) is a new National Trail that will extend around all of England's coast with an associated margin of land predominantly seawards of this, for the public to access and enjoy. Natural England takes great care in considering the interests of both land owners/occupiers and users of the ECP, aiming to strike a fair balance when working to open a new stretch. We follow an approach set out in the approved Coastal Access Scheme and all proposals have to be approved by the Secretary of State. We would encourage any proposed development to include provision for the England Coast Path, where appropriate, to maximise the benefits this can bring to the area. This should not be to the detriment of nature conservation, historic environment, landscape character or affect natural coastal change. Consideration for how best this could be achieved should be made within the Environmental Statement.	Noted. This will be considered with the landscape enhancement plan and all environmental factors considered.

13.3 Legislation, Policy and Guidance

13.3.1 **Table 13.2** presents the legislation, policy and guidance relevant to the landscape/ seascape and visual impact assessment and details how their requirements will be met by the Project.

Table 13.2: Relevant legislation, policy and guidance regarding the landscape/seascape and visual impact assessment

Legislation/ Policy/ Guidance	Consideration within the PEI Report
European Landscape Convention (ELC*)* (Ref 13-1)	
The ELC recognises landscape in law. It focuses specifically on landscape issues and highlights the importance of integration of landscape into areas of policy to promote protection, management and planning of all landscapes including the assessment of landscape and analysis of landscape change.	The assessment aims to comply with the overarching aims of the ELC and considers relevant policies. These policies are outlined within this table. Landscape change is assessed using the landscape and visual baseline as described with **Section 13.5.**
National Policy Statement for Ports (NPSfP*)* (Ref 13-2)	
This is a National Policy Statement for Ports (NPSfP) and provides the framework for decisions on proposals for new port development. The Project is considered to be a Nationally Significant Infrastructure Project (NSIP) within the ports industry. Section 5.11.3 sets out that a landscape and visual assessment should be undertaken and reference to any landscape character assessment and associated studies, as a means of assessing landscape impacts relevant to the proposed project. The assessment should take into account any relevant policies based on these assessments in local development documents. Section 5.11.4 states that the effects during construction on the project and the effects of the completed development and its operation components and landscape character should be included. Section 5.11.5 states that the visibility and conspicuousness of the project during construction and the presence and operation of the project and potential impacts on views and visual amenity. This should include any light pollution effects including on local amenity, rural tranquility and nature conservation.	Published national, regional, and local landscape and seascape character assessments have assisted to determine the landscape baseline and the Project is being assessed against the existing landscape context in terms of landscape character. The published character assessments are included in **Section 13.3.** The assessment considers the landscape and visual impacts of the Project during its construction and operation.
The National Planning Policy Framework (Ref 13-3)	
The revised National Planning Policy Framework (NPPF) was published in July 2021 and includes policies that ensure that these types of developments are:	The NPPF sets out national planning policies that reflect priorities of the Government for operation of the planning system

Legislation/ Policy/ Guidance	Consideration within the PEI Report
'sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change'. **Policy 15**: Conserving and enhancing the natural environment recognises that the environment should be enhanced by: a) *'protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);* b) *recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;* c) *maintaining the character of the undeveloped coast, while improving public access to it where appropriate;* d) *minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;* e) *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and* f) *remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate'.*	and the economic, social, and environmental aspects of the development and use of land. The NPPF has a strong emphasis on sustainable development, with a presumption in favour of such development. **Section 13.3** outlines the published national, regional, and local landscape and seascape character assessments that have assisted to determine the landscape and seascape baseline. **Section 13.8** describes the likely effects of The Project against the existing landscape context in terms of landscape character.
The National Planning Practice Guidance (NPPG): National Design Guide (Ref 13-4)	
NPPG paragraphs 52 and 53 outline the requirement to consider and respond to existing local character and identity. The guidance states that development should consider characteristics of local built form, height, scale, massing and relationships between buildings. Proposals should also consider the scale and proportions of new buildings within the existing landscape context.	This guidance has been taken into account in **Section 13.7** when defining the Project design and proposed mitigation measures.
North Lincolnshire Local Plan Publication Draft Addendum Plan (Ref 13-5)	
The following Policies are relevant to the Project: **DQE1** – Protection of landscape, townscape and views requires that development proposals do not cause unacceptable harm and protect the distinctive character and quality of the landscape. Development proposals should also take account of, views in to and out of development areas and preserve local views and vistas.	The assessment considers landscape character and considers the effects of the Project on views. **Section 13.7** describes the mitigation approach and considers

Legislation/ Policy/ Guidance	Consideration within the PEI Report
DQE12 – Protection of Trees, Woodland and Hedgerows states that trees, woodland, and hedgerows will be retained and protected, and planting schemes will be required to accompany applications for development.	the requirement to protect and retain existing trees, woodland and hedgerows located within the Site boundary.
North East Lincolnshire Local Plan (adopted March 2018) (Ref 13-6)	
The following Policies are relevant to the Project: **Policy 22** - Good design in new developments, outlines North East Lincolnshire County's (NELC) expectations in terms of the design approach for new development. The policy states the requirement for thorough consideration of the site's context, informed by the relevant published landscape character assessments and design guidance for NELC. **Policy 42** - Landscape states the requirement to refer to the published landscape character assessment to determine the local context of the proposed development. It states the requirement for a proportional and site-specific landscape appraisal. It also identifies the requirement for responsive design and mitigation by incorporating landscape buffers by way of suitable landscape planting if appropriate.	**Section 13.8** considers the published landscape character assessment and the landscape context in which the Project is to be located.
East Riding Local Plan (Ref 13-7)	
The following Policy is relevant to the Project: **Policy ENV2**: Promoting a high quality landscape *"Development proposals should be sensitively integrated into the existing landscape, demonstrate an understanding of the intrinsic qualities of the landscape setting and, where possible, seek to make the most of the opportunities to protect and enhance landscape characteristics and features. To achieve this, development should:* *Protect and enhance views across valued landscape features, including flood meadows, chalk grassland, lowland heath, mudflats and salt marsh, sand dunes and chalk cliffs."*	Views from the East Riding of Yorkshire administrative boundary are considered as part of the assessment at Viewpoint 1 and included within **Table 13.4**.
The North Lincolnshire Local Development Framework Development Plan Documents (DPDs) – Core Strategy (adopted June 2011*)* (Ref 13-8)	
The following Policies are relevant to the Project. **Policy CS5** - Delivering quality design in North Lincolnshire notes that all new design in North Lincolnshire should be well designed and appropriate for its context. It notes that developments should incorporate appropriate landscaping and planting that enhances biodiversity and contributes to green infrastructure. **Policy CS12** - Biodiversity and landscape character of the Humber Estuary should be protected and enhanced by harmonising the landscape with port related development activities. The policy	**Section 13.3** considers the surrounding landscape context through the use of published landscape character assessments. **Section 13.7** describes the mitigation approach and considers the requirement to protect and retain existing trees, woodland and hedgerows located within the Site boundary and

Legislation/ Policy/ Guidance	Consideration within the PEI Report
states that the South Humber Gateway Conservation Mitigation Strategy Delivery Plan will develop new green infrastructure directly linked to the Green Infrastructure Strategy for North Lincolnshire.	summarises how these have been addressed in the Project design (this will be considered in more detail in the ES).

13.4 Assessment Scope

13.4.1 The methodology used within this assessment is set out within **Appendix 13.A** (PEI Report, Volume IV).

13.4.2 The LVIA has been undertaken taking into account the following best practice guidance:

a. Landscape Institute and Institute of Environmental Management and Assessment (2013). Guidelines for Landscape and Visual Impact Assessment, Third Edition. (GLVIA3) (Ref 13-9).

b. Landscape Institute (2019). Technical Guidance Note (TGN) 06/2019: Visual Representation of Development Proposals. (Ref 13-10).

c. Landscape Institute (2021). Assessing landscape value outside national designations, Technical Guidance Note 02/21. (Ref 13-11).

d. Landscape Institute (2020). Infrastructure, Technical Guidance Note 04/2020 Limitations and Assumptions. (Ref 13-12).

13.4.3 In the Landscape and Visual Impact Assessment (LVIA), effects are formulated as a function of the value, susceptibility and sensitivity of the receptor, and the nature of effect/magnitude of impact (or change) predicted. A combination of professional judgement, defined thresholds, established criteria and standards will be used in their definition.

The identification of effect significance typically requires the application of professional judgement; however, the overarching significance matrix used in the EIA is shown in **Table 5.3** in **Chapter 5: EIA Approach** and provides a guide for that process. For the purpose of the LVIA, effects which are major are significant, effects which are moderate may be significant/non-significant based on reasoned explanation/judgement and effects which are minor or negligible are non-significant.

Study Area

13.4.4 The extent of the study area is determined by the potential visibility of the Project in the surrounding landscape and is proportionate to the size and scale of the proposals and nature of the surrounding landscape. Guidance GLVIA3 (Ref 13-9) states that the study area should include '*the full extent of the wider landscape around it which the Proposed Development may influence in a significant manner*'.

13.4.5 For the purposes of this LVIA, the study area has been defined by a combination of Zone of Theoretical Visibility (ZTV) analysis and professional judgement. The

ZTV was produced on a worse-case scenario with the largest element (in terms of massing) of the Project being the ammonia storage tank (up to 45m above ground level (AGL)). Heights of structures were taken from confirmed information at the time of assessment. A study area of 2.5km was identified within the Scoping Report (**Appendix 1.A** of PEI Report Volume IV), however, this has been increased to 3km to include locations on the north-coast of the Humber Estuary within the East Riding of Yorkshire. It is considered that views from locations further than 3km are unlikely to result in significant effects. Viewpoint 10 was added as requested by North Lincolnshire Council (NLC) which represents views from the England Coast Path – this viewpoint falls outside the defined study area (refer to **Paragraph 13.1.13**).

Use of Rochdale Envelope

13.4.6 The Project is subject to on-going design to allow for choice of technology, dimensions and configuration of structures. Therefore, the LVIA has been undertaken in accordance with the Planning Inspectorate Guidance Note Nine: Using the Rochdale Envelope (Ref 13-13). The anticipated components for the Project and in particular its main buildings and structures are detailed in **Table 2.1** (**Chapter 2: The Project**).

13.4.7 The magnitude of visual impacts associated with the Project relates to (amongst other criteria) the size and scale of the structures and geographical extent of the area influenced by them. As such, the assessment is based upon indicative maximum dimensions for buildings and structures (i.e. the widest building footprint and tallest potential height) within the Project. A maximum indicative height for the ammonia tank of up to 45m AGL have been assessed, together with an ammonia tank flare of up to 60m in height. The overall massing of the ammonia tank is considered to have the greatest potential to result in significant landscape and visual effects and represents the worst-case scenario as compared to the structures associated with the hydrogen production units, stacks, flares and cooling towers as these elements individually are lesser in height and massing. Some of the indicative maximum/worst case heights of other structures associated with the Project are as follows:

a. Hydrogen Production Unit Flare (45m).
b. Hydrogen Production Unit Main Stack (35m).
c. Hydrogen Liquefier Compressor Building (25m).
d. Cooling Towers (20m).
e. Hydrogen Liquefier Vent (45m).
f. Hydrogen Production Unit (35m).

13.4.8 The maximum dimensions of structures, height of stack(s), quantity and location of these elements will be confirmed in the ES (also refer to **Chapter 2: The Project**).

13.4.9 Due to the height and massing of the ammonia tank within the prevailing flat landscape, open views would be available from the furthermost extents of the study area where there is a lack of intervening features. The ammonia tank

structure would be visible against the skyline and break the horizon from certain viewpoints, recognising this is within a wider backdrop of existing industrial developments and refineries.

Baseline Data Collection

13.4.10 The following sources have been consulted in order to establish baseline landscape and visual conditions:

a. Mapping data from Natural England, including National Character Areas, Country Parks, Local Nature Reserves (Ref 13-14).

b. Mapping data from Historic England including Listed Buildings, Registered Parks and Gardens (Ref 13-15).

c. Google Earth (Ref 13-16).

d. Google Street View (Ref 13-17).

e. Open-Source Data including MAGIC (Ref 13-18).

f. AECOM Geospatial Information (Ref 13-19).

13.4.11 Visits to the study area were conducted on 7 September 2022 and 6 October 2022 in order to further define baseline conditions. The weather during the visits was fair, with sunny intervals and light cloud and good visibility.

Stakeholder Engagement

13.4.12 North East Lincolnshire Council (NELC), North Lincolnshire Council (NLC) and East Riding of Yorkshire Council (ERYC) were contacted on 25 August 2022 regarding proposed viewpoint locations.

13.4.13 NLC responded on 6 September 2022 with a suggested additional viewpoint location (agreeing with the selection of the other locations) which represents views from the England Coast Path (Public Right of Way (PRoW) SKIL50) located within the administrative boundary of NLC and is referenced as Viewpoint 10. At the time of reporting, responses on viewpoint locations from NELC and ERYC have not been received.

13.4.14 Further consultation with relevant council officers and stakeholders will be undertaken during preparation of the ES. This stakeholder consultation will seek to agree key viewpoints, requirements for photomontages and environmental design measures.

Limitations and Assumptions

13.4.15 The information presented in this preliminary assessment reflects that obtained and evaluated at the time of reporting and is based on an emerging design for the Project and the maximum likely extents of land and structures required for its construction and operation.

13.4.16 At the time of reporting, the ZTVs used the ammonia tank height of up to 45m due to the massing and scale of the tank, however, it is considered that the outcome of the ZTVs is unlikely to change if modelled at a height of up to 60m (to accommodate the flare). Open views from the furthermost extents of the study

area, where there is a lack of intervening features, are likely to be available for the ammonia tank and flare. However, significant effects are considered unlikely beyond a study area of 3km as defined within this assessment.

13.4.17 Final details of construction methods are being developed alongside the emerging proposals. Assumptions have been made as to the height of the tallest structures above ground level and anticipated construction methods.

13.4.18 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further through the assessment and consultation processes, and as further research and investigative surveys are completed to fully understand its potential effects. However, a "worst case" assessment has been presented based on the Rochdale Envelope approach.

13.5 Baseline Conditions

Current Baseline

Landscape and Seascape Characterisation

National Character Areas

13.5.1 At a national scale Natural England provide 159 National Character Area (NCA) profiles. Each profile includes a description of the natural and cultural features that shape the landscape. The study area encompasses two NCA profiles as follows:

a. NCA 41: Humber Estuary (Ref 13-20).

b. NCA 42: Lincolnshire Coast and Marshes (Ref 13-21).

13.5.2 Due to the scale of the Project in relation to the NCAs and the lack of intervisibility between the Project and NCA 42, NCA 42 has been discounted as a receptor for the purposes of this assessment, therefore, there will be no further reference to it.

13.5.3 The relevant characteristics of NCA 41 are described below and illustrated in **Figure 13.4** (PEI Report Volume III).

13.5.4 NCA Profile 41: The Humber Estuary covers some areas of the Project and study area. The character area is broadly split into two components, the largest being the expanse of water associated with the Humber Estuary. The estuary is formed by the confluence of several major rivers, including the Trent, Don, Aire, Ouse and Hull, and discharges into the North Sea. Due to its strategic position, the estuary facilitates important and busy trade routes. The land adjacent to the coast is described as a '*low-lying estuarine landscape with extensive stretches of intertidal habitats'*. Due to these elements, the landscape has international significance as a Ramsar site, along with several other designations. The character area provides a varied landscape, with open and extensive views across remote and rural areas, contrasting with heavy industry associated with towns and ports. Due to the factors outlined above, such as the international designations and the influence of the heavy industry, the value of this NCA is assessed to be medium.

National Seascape Character Assessment

13.5.5 At a national scale the study area includes the Marine Character Area (MCA): East described in the National Seascape Character Assessment for England (MM01134) (Ref 13-22) and illustrated on **Figure 13.4** (PEI Report, Volume III).

13.5.6 The MCA East is subdivided into distinct areas within the Seascape Character Area Assessment East Inshore and East Offshore marine plan areas (Ref 13-23) and is located within Character Area 6: Humber Waters. The area is illustrated on **Figure 13.4** (PEI Report, Volume III). The relevant characteristics of MCA 6 Humber Waters are summarised below.

13.5.7 MCA 6 Humber Waters is the second largest coastal plain estuary in the UK and is bound by intertidal mud and sand flats and saltmarsh. These habitats provide internationally important wildlife corridors. Spurn Head, located to the north of the Humber, is a designated feature for geomorphology and wildlife habitats. The character area contains the UK's largest port complex and views are dominated with an extensive and complex mix of industrial, commercial, agricultural, residential and tourism land uses. Shipping traffic using the local ports provide a dominant animated feature. The value of the MCA is assessed to be medium as there are important designated features located within the character area, however the character is heavily influenced by industrial presence.

Regional Character Assessment

13.5.8 At a national scale the Project and study area is located within the Regional Character Area (RCA) Area 3: The Northern Marshes within The Historic Landscape Characterisation Project for Lincolnshire (English Heritage and Lincolnshire County Council, 2011) (Ref 13-24). The RCA is defined by the industrial features along the coast clustered around the deep-water Port of Immingham. The assessment describes the visual dominance and unique character created by views of the large and tall structures, such as Lindsey Oil Refinery, which are linked with the port and heavy industry. The value of this character areas is assessed to be low as the area is dominated by industrial elements and processes.

Local Character Assessment

13.5.9 The Site and study area is covered by three local Landscape Character Assessments which are discussed in turn in the sections below:

a. North East Lincolnshire Landscape Character Assessment Character Assessment (Ref 13-29).

b. East Riding of Yorkshire Landscape Character Assessment (Ref 13-25).

c. North Lincolnshire Landscape Character Assessment and Guidelines (Ref 13-26).

North East Lincolnshire Council Landscape Character Assessment

13.5.10 The NELC Landscape Character Assessment (Ref 13-34) divides the area into three broad Character Areas, with the Project being located within Area A – Humber Estuary.

13.5.11 Area A – Humber Estuary is then sub-divided into Local Landscape Types (LLTs), with the Project located within LLT 1 Industrial Landscape. The character of this area is described as '*Landscapes visually dominated by large or massive structures serving as docks, storage, factories or petrochemical installations. These structures are often separated by extensive open arable land with hedges and groups of trees playing little compositional role in the landscape*.'

13.5.12 Other key characteristics applicable to the study area located with LLT 1 are as follows:

a. Flat and visually open landscape.

b. Large scale industrial works including Immingham Power Station and docks set against large skies.

c. Detracting features such as heavy industry, pylons and wirescape, and busy roads.

d. Established low cut field boundaries and hedgerow trees with taller vegetation along road networks.

13.5.13 The NELC Landscape Character Assessment notes that value of LLT 1 *is assessed to be very low due to the* dominance of detracting features and industry.

13.5.14 Parts of the study area fall within LLT 2: Open Farmland which has key characteristics as follows:

a. Flat landform emphasising large skies with open views towards the industrial areas and docks.

b. Medium to large scale arable farmland with limited development.

c. Detracting features such as distant views of industry, pylons, and busy road network.

13.5.15 The NELC Landscape Character Assessment notes that value of LLT 2 is assessed to be low due to its proximity to the industrial areas and presence of dominating features within the landscape.

13.5.16 Parts of the study area also fall within LLT 3: Wooded Open Farmland which has key characteristics as follows:

a. Virtually flat landform emphasising large skies although gentle undulations are present.

b. Medium to large scale open arable farmland with some woodland blocks with tall hedgerows and mature trees along roadside boundaries.

c. Some detracting features such as pylons, and busy road network.

13.5.17 The NELC Landscape Character Assessment notes that value of LLT 3 is assessed to be medium as the landscape is intact and considered to be in moderate condition. Views of industry are distant and intervening features such as woodland blocks enable detracting features to be accommodated within the character area. Due to the distance from the Project and lack of intervisibility, this character area has been discounted for the purposes of this assessment.

East Riding of Yorkshire Landscape Character Assessment

13.5.18 The eastern part of the study area falls within the ERYC Landscape Character Assessment (Ref 13-25). The area is categorised as Area 21: Drained Farmland Local Landscape Character Type. This landscape character type is then sub-divided into four further character areas. Part of the study area falls within area 21B: Sunk Island.

13.5.19 Some of the key characteristics of Area 21: Low Lying Drained Farmland are as follows;

a. Flat and low-lying flood plain of the River Humber.

b. Sparse tree cover.

c. Open and extensive views across a bleak and featureless landscape.

d. Sky dominates views across the flat open landscape.

13.5.20 Area 21B: Sunk Island is a Conservation Area and exists as an area of historic reclaimed land. Tree and vegetation cover is sparse, and the area is described as bleak. Settlements exist as scattered farmsteads.

13.5.21 The ERYC Landscape Character Assessment notes that the value of Area 21B: Sunk Island is assessed to be high as this area is a Conservation Area and the lack of landscape elements and built form creates a unique character despite the distant views of industry on the horizon.

North Lincolnshire Landscape Character Assessment and Guidelines

13.5.22 A review of the current North Lincolnshire Landscape Character Assessment was commissioned by JBA Consulting (Ref 13-33) and forms part of the evidence base for the emerging North Lincolnshire Local Plan (Ref 13-5). The assessment subdivided the Landscape Character Areas (LCAs) into Landscape Character Types (LCTs). Parts of the study area fall within the Humber Estuary LCA which has key characteristics as follows:

a. Predominantly low-lying estuarine landscape with large skies and open views.

b. Changing character due to tidal influences with low tide revealing extensive areas of mudflats.

c. Limited vegetation cover, although where blocks of woodland occur, these are visually prominent within the view.

d. Urban and industrial influences.

13.5.23 The Local Character Type (LCT) within the Humber Estuary LCA is Industrial Landscape. The key characteristics defining the Industrial Landscape are as follows:

a. Low lying and flat, however, gently undulates as it extends west.

b. Dominated by heavy industry with remnant pockets of flat open farmland.

c. Detracting features such as heavy industry and urban influences such as fences, signs, and major transport corridors.

13.5.24 The assessment states that: *"Landscape infrastructure elements are insignificant within the industrial landscape. Ornamental mitigation planting and amenity trees in grass verges are generally out of scale with the vertical infrastructure and industrial mass."*

13.5.25 The value of this LCA is assessed to be very low due to the dominance and scale of the industry and the inability of landscape elements, as outlined above, to accommodate these detracting features.

Vegetation Cover

13.5.26 Through analysis of the local landscape character assessments, generally the tree and shrub cover in the study area is described as sparse. Woodland blocks, where existing, are visually prominent within the flat landscape. Field boundaries are identified as predominantly native hedgerows that are generally poorly maintained. Taller hedgerows and hedgerow trees tend to be located along roads, adjacent to settlements, and on the outer extents of the study area, where the landscape features tend to be in better condition.

13.5.27 A site visit confirmed that vegetation cover within the study area was consistent to that described within the local character assessments. Due to the low vegetation cover within the Study Area, vegetation within parts of the Site form important landscape features, including an area of woodland known as Long Strip covered by a Tree Preservation Order (TPO). The extent and location are shown on **Figure 2.1** (PEI Report, Volume III).

Topography and Drainage

13.5.28 The topography of the study area is low lying and flat, with many areas existing as historically reclaimed land. An extensive network of ditches artificially drains the land and divide agricultural land into medium to large scale rectilinear fields.

Settlements

13.5.29 The study area is characterised by heavy industrial development associated with Immingham and the docks. Immingham is the main settlement and comprises industry and housing. Stallingborough, a smaller settlement, is located to the south of the study area, as well as several scattered farmsteads.

Communications

13.5.30 The study area is connected to major road networks via the A180 which becomes the M180 and connects to the M18, M62 and A1(M) further to the west (outside the study area). There are two main settlements within the study area (Immingham and Stallingborough) connected by Stallingborough Road (B1210). The Project is connected to the port and the major road network via a series of A and B roads.

13.5.31 There are a number of PRoW within the study area, including the proposed route for the improvements to the England Coast Path between the Humber Bridge and Easington (to the north of the Humber) and Mablethorpe to Humber Bridge (to the south of the Humber). Part of the upgraded route is located within the Site

boundary and is illustrated on Map MHB 3l: North Beck Drain to Queens Road (Ref 13-35).

The Project Site and Immediate Setting

13.5.32 The Project is situated on land that extends from the A1173 (to the east of Immingham) across to the southern coastline of the Humber and to the south of Immingham Docks. The full extent of the Project is shown on **Figure 2.1** (PEI Report, Volume III) and described within **Chapter 2: The Project**.

13.5.33 The Project is located on multiple sites with a combination of field boundaries, roads and the coastal path forming the boundaries. The Site on which the Project would be located comprises areas of brownfield land, former arable fields, a bridleway/ PRoW and the area of woodland known as Long Strip. There is also existing marine infrastructure located adjacent to the Project within the Humber.

Value of the Landscape Receptor

13.5.34 **Table 13.3** provides details of the landscape areas and features of relevance to the Project, and their overall landscape value, based on Assessing landscape value outside national designations, Technical Guidance Note 02/21 (Ref 13-11).

Table 13.3: Non-designated Landscape and Seascape Areas/ Features

Factor	Study Area	The Project Site
Natural Heritage	There are multiple natural heritage elements including national and international designations such as a Special Area of Conservation (SAC), a Special Protection Area (SPA), Ramsar, RSPB important bird areas. There is also a Local Wildlife Site (LWS) located on Laporte Road, close to the Project.	The Project would be located partly within, and partly on land adjacent to, the Humber Estuary Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar site and Site of Special Scientific Interest (SSSI), collectively referred to as the Humber Estuary European Marine Site (EMS). The woodland belt is also subject to a TPO.
Cultural Heritage	The study area contains cultural heritage assets including: two Scheduled Monuments, and a Heritage Conservation Area. There are twelve Listed Buildings distributed across the study area.	There are no cultural heritage designated interests located within the Site boundary.
Landscape/Seascape Condition	The landscape and seascape of the study area is predominantly open, low-lying land around the coast, influenced by industry, pylons and transport routes. Heavy industry is located around the deep-water Port of Immingham. Other parts of the study area are low lying open arable land with scattered	Generally poor condition with the East Site comprising brownfield land and influenced by adjacent industrial land use. The West Site comprises former agricultural fields, however, these are also influenced by Queens Road, an electrical sub-station, with overhead electricity cables.

Factor	Study Area	The Project Site
	buildings/ farmsteads. The landscape to the north of the Humber is described as bleak. Landscape quality is poor where industry and power stations are present, however, more rural areas on the outer limits of the study area have a moderate to good landscape condition. The seascape is influenced by heavy industry and port infrastructure and operations.	Field boundaries, where they exist on the West Site, are poorly managed and comprise overgrown species-poor hawthorn. Within the East Site and adjacent to the boundary is a narrow belt of TPO woodland. Mature trees and vegetation also exist along Laporte Road within the Site boundary. The area located within the Humber is adjacent to, and influenced by, the existing Oil Terminal Jetty.
Scenic quality	Views comprise open flat landscapes with large skies and seascapes with views across intertidal mudflats and open water. The industrial complex associated with the Port has a strong visual influence over the generally flat, low-lying surrounding landscape and seascape creating a dramatic skyline. The more rural areas on the outer limits of the study area, to the south of the railway line and to the north of the Humber (Sunk Island), have fewer detracting features. However, Sunk Island is described as bleak due to its lack of features and sense of remoteness due to its coastal location.	Western parts of the Site have a very low scenic quality. To the east, the landscape is more appealing due to the dynamic qualities expressed by the surrounding industry and port activity. The scenic quality varies across the site and is influenced by the scale of the industry and the expansive views over the Humber Estuary where they exist.
Associations	No literary value, connections with notable people or arts has been identified.	No literary value, connections with notable people or arts has been identified.
Distinctiveness	The study area contains urban features which are distinctive to the location. The Humber Estuary and intertidal habitats create a unique landscape. The strong industrial presence with flat topography and large skies creates a strong sense of place. The industrial influences found within the study area is representative of the identified landscape character at a national, regional, and local level.	The Site contains few rare features, however, there is a narrow woodland belt subject to a TPO and mature trees along Laporte Road in a study area where tree cover is generally low.

Factor	Study Area	The Project Site
Recreational	The landscape within the study area contains PRoW which include both footpaths and bridleways. These generally radiate from Immingham and connect to the surrounding countryside. The England Coast Path is a new National Trail encircling the English coastline. Proposals for the upgrade of sections of the England Coast Path extend along both the north and south coastlines of the Humber within the study area. The recreational value is low, however, a campsite is located within the northern extents of the study area.	Part of the proposed route upgrade to the England Coast Path is located on an existing bridleway within the Site boundary and adjacent to the boundary. There is no other PRoW within the Site and no other recreational uses. There is no open access to the Humber Estuary and coastal areas.
Perceptual (Scenic)	The study area is not a landscape that has evident value through appealing to the senses, primarily the visual sense. The study area contains small areas regarded as tranquil and remote, especially on the northern and southern limits of the study area where detracting features are less prominent. The scenic value of the seascape is influenced by industry along the coastline and shipping activity within the Humber. Tranquillity of the general area is eroded by major transport corridors and imposing industrial presence.	The Site has no particular or notable scenic value, albeit the TPO tree belt adds to value in an otherwise industrial context.
Perceptual (Wildness and tranquillity)	The study area contains small areas regarded as tranquil and remote, especially on the northern and southern limits of the study area. Tranquillity of the general area is eroded by major transport corridors and imposing industrial presence. Wildness is not a key characteristic in the land areas but present in the estuary and seascape.	Tranquillity and wildness are low due to adjacent land use and activity associated with the Port.
Functional	The landscape which performs a clearly identifiable function as a long standing industrial and port influenced area.	Industrial, brown field/undeveloped land, where previous development and land use no longer exists and has left

Factor	Study Area	The Project Site
		areas of the Site without a clear or defined function.
Overall landscape value	**Low** The study area does not include any areas designated locally for their landscape character and/ or perceptual qualities/ tranquillity. The study area is also heavily influenced by industrial development, port infrastructure, residential areas and transport corridors both on land and within the Humber.	**Low** The Project is located in an area surrounded by existing industrial development with few important landscape features. The landscape elements within the Site boundary do not contribute to the landscape or seascape value or contribute distinguishing features to the identified landscape or seascape character. Despite the detracting features, the Site boundary contains features such as the England Coast Path route and the TPO woodland.

Existing Visual Baseline

Zone of Theoretical Visibility (ZTV) Analysis

13.5.35 In order to identify locations with potential views of the Project, a ZTV for bare earth (**Figure 13.2:** Zone of Theoretical Visibility – Bare Earth) and one including visual screening (**Figure 13.3**: Zone of Theoretical Visibility – Visual Screening) have been produced. These identify those areas which have potential for views of the Project and to what extent it is likely to be visible. The ZTVs are illustrated in **Figure 13.2** and **Figure 13.3** (PEI Report, Volume III).

13.5.36 The ZTVs were produced on a worse-case scenario with the largest (in terms of massing) element of the Project being the ammonia storage tank (height of 56m above ground level provided for the production of the ZTV). The ZTV was based upon a grid of points spaced 10m apart and along the perimeter of the indicative areas of development as shown on the Overall Site Plan for Permitting Immingham NH_3 terminal Immingham by Air Products and Chemicals Inc and is illustrated within **Figure 2.3** (PEI Report, Volume III).

13.5.37 The ZTVs were generated by analysis of a 3D digital terrain model (DTM) of the surrounding terrain and the Project. The bare earth ZTV has been generated using Ordnance Survey (OS) Terrain 5 digital terrain data which does not take into account the screening effects of vegetation, buildings or other structures. The visual screening ZTV has been generated using the same data and uses woodland from the Forestry Commission National Forest Inventory (2018) with an assumed tree height of 15m, building height data from OS Master Map and buildings from OS Open with an assumed height of 7.5m. The ZTVs are based upon an observer eye height of 1.7m.

Visual Receptors and Viewpoints

13.5.38 Visibility within the wider study area is generally widespread due to the low-lying land along the coast and lack of intervening vegetation. There are widespread open views in the north-east looking south across the estuary towards the Project and to the east from the coastline. Where views are available from the south, they are expansive and comprise large skies with vertical features associated with industrial activity on the horizon.

13.5.39 Users of the main transport routes and long-distance trails gain dynamic views towards the Project to varying degrees, dependent on intervening structures, screening vegetation, elevation and direction of travel.

13.5.40 Users of the railway line between Stallingborough and Habrough would gain transient, dynamic views towards the Project at an oblique angle. Views would include a landscape containing large areas of farmland, industrial structures, overhead power lines and highway infrastructure.

13.5.41 Within the study area there are a number of local roads in proximity of the Project which connect Immingham and the Port to major road networks. Generally, views whilst travelling on these roads are dynamic and vary at different points along the road depending on the level of enclosure and intervening features. At locations closer to the Project, views are often restricted by screening vegetation and built form located along the road corridors.

13.5.42 Due to the flat landscape, visibility is restricted within closer proximity to the Project by built form and vegetation, thus enabling contrasts between enclosure and expansive views.

13.5.43 Through consultation and agreement with the relevant stakeholders, a total of 11 viewpoints have been chosen to represent the typical range of views of the Project within the study area. These viewpoints are listed in **Table 13.4** and illustrated on **Figures 13.8.1** to **13.8.10** (PEI Report, Volume III).

Table 13.4: Representative Viewpoints

Viewpoint ID	Name & Location	Receptor Type	Elevation m (AOD)	Grid Reference	View
1	PRoW PAULF06/ Cherry Cobb Sands Road. England Coast Path	Users of PRoW	1.15	523506, 418907	Viewpoint 1 is located on the northern coastline of the Humber Estuary where Cherry Cobb Sands Road meets PRoW PAULF06. The path forms part of the England Coast Route. The view is open and expansive over the flat landscape with distant views to the south. There is a high level of tranquillity and remoteness at this location. The view extends across the mudflat and saltmarsh coastal margin and open water of the r Humber Estuary to the southern coastline of the estuary. The landscape at the viewpoint is characterised by low tussocky vegetation associated with mudflats and open shallow pools connected by tributaries to the Humber. Development in this location comprises occasional isolated dwellings and a number of small fishing boats moored at Stone Creek. The southern coastline and horizon are defined by an almost continuous line of industrial development, including large structures and tall vertical elements. There are also several large shipping vessels located within the estuary, which obscure remaining views of the coastline. The viewpoint is located within close proximity to Scheduled Monument - Stone Creek heavy Anti-aircraft gun site, at Sunk Island Clough. **Value of the view:** The view is not protected by a designation, however, is considered to be locally valued as the PRoW forms part of the proposed England Coast Path. The value of the view is assessed to be medium.
2	PRoW NKIL50 England Coast Path	Users of PRoW	4.79	521630, 415255	Viewpoint 2 is located on the coastal path to the east of the Project and looks west in the direction of where the proposed in-river jetty connects to the river frontage. On land, the view is confined to medium range and enclosed by a narrow woodland belt, Long Strip, which defines the bridleway/ PRoW and the north-western boundary of the Project. These trees are subject to a woodland TPO. The view comprises the coastal path which extends along the flood defences, the coastal margin with mudflats and low vegetation, existing jetty with landside infrastructure associated with the Port, and

Viewpoint ID	Name & Location	Receptor Type	Elevation m (AOD)	Grid Reference	View
					industrial buildings and infrastructure located on Laporte Road. There are also some taller structures visible above the tops of the trees. The view looks towards the East Site. **Value of the view:** The view is not protected by a designation, however, is considered to be locally valued as the bridleway/ PRoW forms part of the England Coast Path route. Heavy infrastructure is present within the scene providing detracting features. The value of the view is assessed to be medium.
3	England Coast Path	Users of bridleway/ PRoW	5.5	521311, 415505	Viewpoint 3 is located on the coastal path to the west of the Project and looks east along the existing flood defences and path. The view is open and comprises distant views down the River Humber to the south-east. To the south is an existing bridleway/ PRoW, which is enclosed by mature trees and vegetation and a small to medium sized field forming part of the Project. More distant features associated with the land comprise structures and buildings associated with industry which include tall vertical elements. **Value of the view:** The view is not protected by a designation, however, is considered to be locally valued as the bridleway/ PRoW forms part of the England Coast Path route. Heavy infrastructure is present within the scene providing detracting features. The value of the view is assessed to be medium.
4	Queens Road	Local road users and commercial premises	2.2	521311, 414743	Viewpoint 4 is located on Queens Road. To the north, the road is bound by a pavement and wide grass verge with commercial units adjacent. To the south, the road is bound by a rough grass verge with scattered vegetation. Views are confined to the medium range by intervening scrubby vegetation and small blocks of mature trees. Street lighting, road signs, parked cars, and Queens Road Power Station introduce detracting features into the scene. Overhead pylons and a spoil heap are also visible in the distance to the south. **Value of the view:** The view is heavily influenced by urban development, detracting features and industry. The value of the view is assessed to be low.

Viewpoint ID	Name & Location	Receptor Type	Elevation m (AOD)	Grid Reference	View
5	PRoW to the east of Immingham	Users of the PRoW	2.12	509289, 414779	Viewpoint 5 is located on a PRoW between the eastern edge of Immingham and Kings Road. The view extends over a small to medium sized arable field containing the PRoW. A small footbridge crossing a drain with scrubby vegetation occupies the foreground with mature vegetation enclosing the horizon. Detracting features such as an industrial facility, Queens Road Power Station, overhead pylons and a spoil heap are also visible in the distance to the south. The view looks to the east towards the West Site. **Value of the view:** The view contains many rural elements. However, it is influenced by detracting features and industry and is not protected by a designation. The value of the view is assessed to be low.
6	PRoW to the rear of Ings Lane/ Talbot Road	Residents located to the edge of Immingham and users of the PRoW	1.98	519048, 414526	Viewpoint 6 is located on the eastern edge of Immingham to the rear of residential development on Ings Lane/ Talbot Road. The view extends east across an area used recreationally and comprises rough grass, scrub, and a small area of woodland with a tarmac car parking area in the foreground. Views of industry are available to the north-east where gaps in the vegetation allow for more distant views. **Value of the view:** The view contains some detracting features, however, is considered to be valued locally. The value of the view is assessed to be low.
7	PRoW to the north west of Mauxhall Farm	Users of the PRoW	3.16	519090, 413323	Viewpoint 7 is located on a PRoW to the south-west of the West Site. The view extends over the large arable field in which the footpath is contained. The landscape is open and flat. The horizon is enclosed by mature vegetation and marked by the presence of heavy industry and vertical infrastructure, such as pylons and cranes. **Value of the view:** The view is not protected by a designation and contains some detracting features, however, is considered to be valued locally. The value of the view is assessed to be low.

Viewpoint ID	Name & Location	Receptor Type	Elevation m (AOD)	Grid Reference	View
8	PRoW to the north western edge of Stallingborough	Residents located to the edge of Stallingborough	1.81	520649, 412061	Viewpoint 8 is located on a PRoW to the rear of houses on Station Road, Stallingborough. The landscape is open and flat and generally rural in character. The view extends over medium to large arable fields with occasional mature trees and small patches of scrub. The horizon is enclosed by mature vegetation. A network of pylons introduces vertical elements and detracting features into the scene. The stacks and flair stack at Lindsey Oil Refinery is just visible on the horizon to the north west. **Value of the view:** The view is not protected by a designation and contains some detracting features, however, is considered to be valued locally. The value of the view is assessed to be low.
9	B1210 (adjacent to the railway line)	Local users of the road	10.54	518447, 412430	Viewpoint 9 is located on the B1210 to the south-west of the Project. The landscape is open and flat and generally rural in character with a recently ploughed field forming the midground. The A1173 is located within the mid-view adding moving vehicles to the scene. The horizon is enclosed by mature vegetation and built form. Tall vertical elements, such as the cranes associated with the Port, stacks, overhead pylons, and street lighting are visible across the horizon. **Value of the view:** The view contains detracting features across the extent of the horizon. The value of the view is assessed to be low.
10	PRoW SKIL50 England Coast Path	Users of the PRoW	3.57	518160, 417989	Viewpoint 10 is located on the England Coast Path approximately 3.5km to the north-west of the Project and falls outside the study area. The view comprises heavy industrial elements associated with the Docks, including the Ore Terminal, associated infrastructure, and jetties. The view is dynamic and tranquillity is low. **Value of the view:** The view is dominated by detracting features, however, is considered to be valued locally due to its location on the England Coast Path route. The value of the view is assessed to be low.

Viewpoint ID	Name & Location	Receptor Type	Elevation m (AOD)	Grid Reference	View
11	Kings Road, Immingham	Residents of houses and commercial receptors	>10m	519676, 414814	Viewpoint 11 is located on Queens Road to the north of the West Site. The residential receptors are located on the west of Queens Road with the rear of the properties orientated to face south-west towards the West Site. Views from the front of the properties are orientated towards Queens Road and commercial buildings located to the east of Queens Road. The main focus of the view from the front of the residential properties is the road, with its associated features such as parked cars along both sides, street lighting and metal fencing. The view is enclosed by commercial development, which includes a series of prefabricated metal and brick buildings containing light industry and offices. These buildings are partially screened by a single row of trees and ornamental planting. To the rear of the residential properties, extends a series of three former agricultural fields which comprise the West Site. The fields are flat and open and allow for views across to Kings Road Power Station (adjacent to the north-western corner of the West Site). Views of tall vertical elements, such as overhead pylons, and structures associated with Kings Road Power Station, street lighting are likely from the rear of the residential properties. **Value of the view:** The view contains detracting features across the horizon and the focus of the view is of the road and commercial/ industrial buildings located along the road. The value of the view is assessed to be low.
NV	St Peter's and St Paul's Church and PRoW	Users of the PRoW and visitors to the church	8.31	519491, 411803	The viewpoint was visited, however, there were no views of the Project from this location due to intervening landform and vegetation. The viewpoint is located at Scheduled Monument – Stallingborough medieval settlement, post medieval manor house and formal gardens and within close proximity to Scheduled Monument – Churchyard cross 20m south of St Peter and St Paul's Church. The Viewpoint is shown on **Figure 13.7** (PEI Report, Volume III) as 'nv' (no view).

Summary of Visual Baseline

13.5.44 The extent of views of the Project available to receptors range from close proximity views to long distance views. Receptors are located at the edge of villages, along roads and transport networks and on various PRoW within the study area.

13.5.45 The study area is characterised by low lying arable land, influenced in most parts by industrial development and the Port of Immingham. Large scale pylons and transmission lines transect the landscape and tall cranes within the Port. Due to the low-lying landform within the study area, views of these structures are available where vegetation and built form allow. In localised areas, small, isolated woodlands and boundary vegetation offer a degree of visual enclosure. Much of the vegetation within the study area is deciduous, therefore, there will be varying degrees of visibility depending on the time of year.

Future Baseline

13.5.46 The future baseline is a prediction of baseline conditions in the future, assuming that the Project is not constructed. In the absence of the Project, parts of the Site will continue to be utilised for port activity. As such, the future landscape/ seascape and visual baseline at a site scale is anticipated to be similar to the existing baseline as described above.

13.6 Potential Impacts and Effects

Landscape and Seascape

13.6.1 The preliminary assessment has identified that construction, operation and decommissioning of the Project has the potential to result in adverse impacts on landscape/ seascape character.

13.6.2 The potential landscape impacts of the Project primarily relate to the visibility of proposed structures (temporary and permanent), including how this affects the perceptual qualities and tranquillity of a character area and the direct loss of landscape features within the Site boundary.

13.6.3 With regard to the Project construction phase, potential landscape and seascape impacts relate to the following:

a. Construction of the marine infrastructure requiring dredging. Dredging to take place within the sub tidal area.

b. Minor losses of scattered scrub where this coincides with localised areas required for temporary works.

c. Temporary removal of areas of arable farmland for construction laydown activities.

d. Loss of trees within the Long Strip TPO woodland to facilitate the development of the operational access road to the jetty, and pipeline.

e. The introduction of stationary and moving plant including cranes and piling rigs, jack-up barge and other high-level construction machinery and marine construction vessels.

f. The introduction of low-level construction operations including temporary stockpiling of storage of materials, contractor/ welfare facilities and temporary laydown areas.

g. Construction vehicles including heavy goods vehicles (HGV) entering and leaving the Site and surrounding area.

h. The progressive construction of tall structures, including new stacks and the ammonia storage tank.

i. Construction lighting to illuminate site operations after dark.

13.6.4 With regard to the Project operational and commissioning phase, potential landscape impacts relate to the following:

a. Introduction of large-scale buildings and structures and marine infrastructure including a jetty with up to two berths, with topside infrastructure.

b. New access points connecting the Project with local roads (Laporte Road, Kings Road and the A1173).

c. Introduction of additional site lighting, where required for operational safety.

d. Movement of additional vehicles and shipping vessels within and around the operational area, jetty and within the Humber.

e. Potential visibility of plumes and infrequent, flares (in exceptional circumstances, i.e. for emergency use only and during start up and shut down, rather than routinely and flares to be fitted with shroud to minimise visibility of pilot).

13.6.5 **Table 13.5** provides an assessment of the sensitivity of the landscape receptors identified within the study area.

Table 13.5: Landscape Sensitivity Assessment

Landscape/ seascape receptor	Sensitivity Assessment			
	Value	Susceptibility		Sensitivity
Natural England National Character Area Profiles (Ref 13-20 and Ref 13-21)				
NCA Profile 41: Humber Estuary	Medium	Very Low	The low-lying open landscape contains some nationally significant conservation features, although is influenced by the presence of existing large-scale infrastructure. Susceptibility to change arising from the Project is therefore considered to be very low due to the scale of the Project in relation to the character area. In addition, the introduction of industrial elements is considered to be consistent with the identified defining characteristics of the NCA.	Low

Landscape/ seascape receptor	Sensitivity Assessment			
	Value	Susceptibility		Sensitivity
National Seascape Character Assessment for England (MM01134) (Marine Management Organisation, 2018) (Ref 13-22)				
MCA 6: Humber Water Marine Character Area (MCA): East	Low	Very Low	Bound by intertidal mud and sand flats and saltmarsh, the habitats within this character area provide internationally important wildlife corridors. Spurn Head, located to the north of the Humber, is a designated feature for geomorphology and wildlife habitats. The character area contains the UK's largest port complex and views are dominated with an extensive and complex mix of industrial, commercial, agricultural, residential and tourism land uses. Shipping traffic utilising the ports provide a dominant animated feature. Susceptibility to change arising from the Project is therefore considered to be very low as the introduction of industrial elements is consistent with the defining characteristics as described above.	Low
The Historic Landscape Characterisation Project for Lincolnshire (Ref 13-24)				
RCA Area 3: Northern Marshes	Low	Very Low	The published landscape character assessment states that the landscape is heavily influenced by industrial features and that despite the presence of detracting features, the industry creates a character which is dramatic and unique. The industrial development respects the historic landscape pattern by continuing the existing orientation and rectilinear form. Susceptibility to change arising from the Project is therefore considered to be very low due to the existing context of the industrial features.	Low
North East Lincolnshire Landscape Character Assessment Sensitivity and capacity Study (FPCR Environment and Design Ltd, 2015) (Ref 13-29)				
LCA Area A – Humber Estuary LLT 1 – Industrial Landscape	Low	Very Low	The landscape does not contain any designated features and the condition is described as poor within the landscape character assessment. The landscape is heavily influenced by large scale industry and there are many detracting features influencing the landscape character.	Very Low

Landscape/ seascape receptor	Sensitivity Assessment			
	Value	Susceptibility		Sensitivity
			Tranquillity is further eroded by the network of busy roads, such as the A180 and A1173. The susceptibility to change arising from the Project is considered to be very low as the introduction of industrial elements is consistent with the defining characteristics.	
LCA Area A – Humber Estuary LLT2 – Open Farmland	Low	Low	The area contains Great Coates Conservation Area (outside the study area) and is considered to be in moderate condition as described within the published landscape character assessment. Distant views of industry form part of the identified character. The susceptibility to change arising from the Project is considered to be low.	Low
North Lincolnshire Landscape Character Assessment and Guidelines (Ref 13-30)				
The Humber Estuary LCA Landscape Character Type – Industrial Landscape	Low	Very Low	The landscape is degraded in places containing a high number of detracting features including industrial development along the coastline. Tranquillity is assessed to be low. Susceptibility to change arising from the Project is considered to be very low as the introduction of industrial elements is consistent with the defining characteristics.	Very low
East Riding of Yorkshire Landscape Character Assessment (2018) (Ref 13-25)				
Drained Farmland LCA 21 21B – Sunk Island	High	Very Low	The area is a Conservation Area and contains a number of ecological designations. It is considered to be in reasonable condition. Detracting features are present within the landscape along the horizon on the southern coastline of the Humber. The susceptibility to change arising from the Project is considered to be very low as the area will be able to accommodate the Project without compromising the baseline situation.	Medium

Landscape/ seascape receptor	Sensitivity Assessment			
	Value	Susceptibility		Sensitivity
Landscape and Seascape Character of the Site and immediate setting				
Humber Estuary	Low	Low	Character influenced by large shipping vessels and existing jetties protruding seawards into the Humber. The susceptibility of the off-shore area to changes arising from the Project is assessed to be low.	Low
Landside Landscape Features - East Site	Low	Low	Character influenced by traffic movements and disturbance associated with Laporte Road. Industrial development, such as the Associated Petroleum Terminal works complex, inform the character of the East Site and its immediate setting and introduces dominant detracting features. The land is currently brownfield land and contains areas of hard-standing, gravel, and various stockpiles. Therefore, the susceptibility of the East Site to changes arising from the Project is assessed to be low.	Low
Landside Landscape Features - West Site	Low	Low	Comprises three former agricultural fields bound by hedgerows and ditches. The West Site has a simple character which is influenced by Queens Road, Kings Road, and the A1173 adjacent to the boundary. Industrial complexes located on Queens Road, two sub-stations, and overhead pylons reduce the West Site's susceptibility to the Project. Therefore, the susceptibility is assessed to be low.	Low
Landside Landscape Features - Pipeline Areas and access road	Low	Medium	Pipeline areas are located alongside Queens Road and Laporte Road, where the character is influenced by the busy roads and associated features such as street lighting and signage. Another pipeline runs from the East Site to the proposed jetty. In addition to the pipeline, a proposed operational access road is located adjacent to the pipeline and connects Laporte Road to the jetty. The pipeline and proposed access road will impact 'Long Strip' woodland (covered by a TPO) and mature trees and vegetation to Laporte Road, however the extent of tree loss is unknown at this	Medium

Landscape/ seascape receptor	Sensitivity Assessment			
	Value	Susceptibility		Sensitivity
			stage (tree loss is considered further in **Chapter 8: Terrestrial Ecology**). Due to the presence of mature trees and TPO, the susceptibility of the Pipeline Areas is assessed to be medium.	
Landside Landscape Features - Construction Laydown Areas (temporary)	Low	Low	Located adjacent to Laporte Road and Queens Road, these areas are influenced by the adjacent busy road networks and detracting features such as overhead pylons and industrial complexes. The tranquillity within the areas is low. The susceptibility of the temporary Construction Laydown Areas to construction activity associated with the Project is assessed to be low.	Low
Overall character	Low	Low	The pattern of the landscape ranges from degraded to intact and the Site is dominated by industrial complexes and activity. The tranquillity across the Site is low due to adjacent land uses and road networks. Overall, the susceptibility to change arising from the Project is considered to be low due to its location within the surrounding industrial landscape context.	Low

Visual Amenity

13.6.6 The preliminary assessment has identified that construction, operation and decommissioning of the Project has the potential to result in adverse impacts on visual amenity.

13.6.7 The potential visual impacts of the Project primarily relate to the visibility of proposed structures (temporary and permanent) to receptors in the surrounding areas. The impact sources are considered to be the same as detailed above for landscape and seascape (refer to **Paragraphs 13.1.3** and **13.1.4**).

Decommissioning – landside infrastructure

13.6.8 The landside elements of the Project have a design life of up to approximately 25 years. The impacts on landscape character and visual amenity arising as a result of Project decommissioning for the landside elements are considered to be similar to those identified at the construction stage of the Project. For landscape, this is as a result of the scale and nature of the development in relation to the existing industrial structures and complexes present in the wider landscape and the large scale of the landscape character areas. For visual amenity, this is as a

result of the visibility of decommissioning and demolition activities being of a similar nature to those during construction for the landside elements.

Decommissioning – marine infrastructure

13.6.9 The Project does not make any provision for the decommissioning of the marine facilities of the Project and therefore the impacts on landscape and seascape character and visual amenity have not been assessed for these elements.

13.6.10 Once the decommissioning process has been completed, it is anticipated that the resulting conditions would be similar to those that currently exist as detailed in **Chapter 2: The Project** with the exception of the marine infrastructure which will remain operational and used for port-related activities.

13.7 Development Design and Impact Avoidance

Embedded Mitigation Measures

13.7.1 The Project will be designed, as far as possible, to avoid and minimise impacts and effects to landscape/ seascape and visual receptors through the process of design development, and by embedding mitigation measures into the design.

13.7.2 It is considered that the opportunity to mitigate some visual effects associated with the Project are limited due to the size and scale of the Project. The landscape mitigation is not dictated by a need for screening or landscape integration and in most locations trees and woodland would not be effective in reducing effects on visual amenity. Any planting which may be provided is unlikely to mitigate landscape and visual effects.

13.7.3 The TPO designation on the Long Strip woodland indicates value/importance at a Site level. Given current uncertainties over construction requirements, it is not possible to quantify the exact scale of woodland loss within the Long Strip at this stage although it is anticipated that some woodland will be retained along the eastern edge. However, given the scale and nature of the industrial context the loss of trees would not materially change the nature of landscape / visual effects.

13.7.4 It is considered that an integrated design approach that considers massing and the disposition of taller structures within the Project to minimise potential wall effects has potential to reduce visual impacts of the Project. The finishes of the buildings and exact sizes of component parts are not yet finalised. However, given the nature of the Project, it is anticipated that it would have a close visual relationship with existing nearby structures. Details regarding the Project design will be presented in the ES. Implementation of detailed design parameters would be secured by a requirement in the draft DCO.

13.7.5 In order to mitigate for tree loss from the Long Strip and elsewhere, the following approach is proposed:

a. Tree planting within some peripheral areas around the operational sites of the hydrogen production facility, although these opportunities will be very limited; and

b. Opportunities to be explored for potential off-site tree-planting within areas to be agreed with local bodies/organisations.

Table 13.6: Construction Mitigation Measures

Mitigation Measures
• Stripping, handling and management of soils to be in accordance with DEFRA (2009) Construction Code of Practice for the sustainable use of soils on constructions sites (Ref 13-31); and Considerate Construction management. • Perimeter fencing, maintain a tidy site and temporary screen bunding. • Ensuring that valued trees, woodland, existing vegetation and other landscape features are protected and retained wherever possible, in accordance with BS5837:2012. Trees in relation to design, demolition and construction (Ref 13-32). Trees should be clearly marked so that site operatives are in no doubt as to which ones are to be kept and protected. • Where it is unavoidable to site underground services beneath the canopy of trees, it is essential that trenches are dug by hand so that no roots are unnecessarily cut. • Ground Level - Changes required to existing ground levels and the working room required for the installation of the site haul/access roads may adversely affect the adjacent trees. • The route of the underground utilities needs to be considered at an early stage as these often require significant earthworks. Ideally these should be incorporated within the areas affected by the site/access roads. • The layout must take into account the height/root spread of future growth of trees and the necessary steps taken to avoid potential root damage to buildings, roads and underground services. • With regards to the location of existing trees and shrubs, the National House-Building Council (NHBC) sets out guidelines which determine the foundation design of new buildings in relation to existing and proposed vegetation.

13.7.6 Construction of the Project would be subject to measures and procedures defined within a Construction Environmental Management Plan (CEMP), which would be produced prior to the commencement of construction by the Principal Contractor and would be based on, and incorporate, the contents and requirements of the outline CEMP which will be submitted with the DCO application.

13.7.7 The following mitigation measures are recommended as per **Table 13.7**.

Table 13.7: Operation Mitigation Measures

Category	Mitigation Measures
Embedded mitigation measures - developed through the iterative design process, which have become integrated or embedded into the project.	• Ensuring that soil structures are protected where land would be used temporarily, such as for compounds, re-grading areas etc. so that when it is returned to the existing land use, it is in a suitable condition; compounds, re-grading areas etc. • Avoid loss or damage to landscape features (e.g. hedges, hedgerows, individual trees and the TPO area) where possible within the constraints of the design.
Standard mitigation measures- construction and operational management practices for avoiding and reducing environmental effects	• Use native species of local provenance wherever possible; and where possible severed hedgerows and treelines will be reconnected using appropriate native species • Existing trees (where retained) would benefit from a buffer zone, where possible and within the constraints of the Project as this would enable associated ground flora and fauna to be protected and make them more effective as a wildlife corridor. This would also help to reduce changes in ground levels close to the trees. Buffers would be fenced off to their full width prior to development.
Additional mitigation measures - designed to address any residual adverse remaining after primary measures and standard construction practices have been incorporated into the scheme.	• Seek to provide tree planting where possible which has a varied spatial/vertical structure and species composition which increases their biodiversity value. Although the opportunity to provide screen planting is likely to be very limited due to the constraints of the project.
Enhancement measures - improve the landscape resource over and above the landscape setting	• Conserve the woodland blocks as far as practicable and apply an appropriate management strategy for continued ecological interest. • Design for maintenance, giving due consideration to the maintenance costs and implications, liabilities and access arrangements for all landscape areas.

13.8 Landscape/ Seascape Effects

13.8.1 The Project would introduce new large-scale industrial development and marine infrastructure into an area where heavy industry and port facilities is an established land-use. Pylons, overhead lines and transport networks, including shipping within the Humber, are dominant and form the landscape and seascape context to the Project. These features inform the landscape and seascape character immediately adjacent to the Project. The existing industry and port facilities have an influence over the extent of the study area.

13.8.2 Taking into account defined embedded mitigation measures, the Project characteristics and the prevailing landscape, **Table 13.8** provides an assessment of the potential landscape and seascape effects associated with the Project construction phase, whilst **Table 13.9** considers effects during Project operation. It is considered that the effects identified associated with Project construction are also applicable to the Project decommissioning phase apart from the marine infrastructure which is to remain in operation beyond the anticipated 25-year design life.

Table 13.8: Assessment of Landscape and Seascape Effects - Construction

Landscape / seascape type	Sensitivity of receptor	Description of impact	Predicted magnitude of change	Classification of effect
MCA 6: Humber Water	Low	The Project will introduce construction activities which will directly impact the MCA. This will include dredging to facilitate the construction of the jetty. Other marine and landside construction activity, including marine construction vessels, will add visible disturbance and impact the tranquillity of the MCA. Construction activities will be viewed in context with other large-scale industry and appear in context with the already dynamic landscape and existing large-scale jetties. The size and scale of the construction works in relation to the Project is moderate in relation to the MCA in general and the key characteristics of the landscape will be retained. The impact is assessed as **low**, over a medium geographical extent, short term and temporary. This will result in a minor adverse not significant effect.	Low	Minor adverse (not significant)
LLT 1 – Industrial Landscape	Very Low	Construction associated with the Project will directly impact the LLT as a result of construction activities and removal of landscape features. Construction activities will be viewed in context with other large-scale industry, however the tranquillity within LLT will be eroded further. Due to the presence of these large-scale structures within this LLT and the nature of construction activities, it is assessed that the Project will have a limited potential to impact the landscape characteristics. Impacts will be **very low**, over a medium geographical extent, short term and temporary. This will result in a negligible adverse not significant effect.	Very Low	Negligible adverse (not significant)
LLT2 – Open Farmland	Low	The Project lies outside of this LCT but will introduce views of construction activity into it. Distant views of industry to the east, against large skies, is characteristic of this area. Views of industry, together with the network of high voltage pylons, introduce detracting features into the landscape. It is anticipated that the construction of the Project will result in a limited perceptible change to the landscape character and tranquillity. The impact is assessed as **very low**, over a small geographical extent, short term and temporary. This will result in a negligible adverse not significant effect.	Very Low	Negligible adverse (not significant)

Landscape / seascape type	Sensitivity of receptor	Description of impact	Predicted magnitude of change	Classification of effect
21B – Sunk Island	Low	The Project lies outside of this LCT but will introduce views of construction activity into it. Due to expansive views containing large-scale structures including Killingholme Oil Refineries, Immingham Oil Terminal, Immingham Docks, and other heavy industry, it is considered that the construction of the Project will result in limited perceptible change to the landscape character and tranquillity. The impact is assessed as **very low**, over a small geographical extent, short term and temporary. This will result in a negligible adverse not significant effect.	Very Low	Negligible adverse (not significant)
The site and its immediate setting	Medium	The Project will require the construction of large-scale marine and landside infrastructure onto a site which is already set within the context of an industrial landscape. Construction methods to include dredging, piling, Horizonal Directional Drilling (HDD) and/or digging of open trenches for pipelines and will include the delivery of construction materials and plant. Construction activity will result in the further erosion of tranquillity and features which will contribute additional disturbance and movement. Temporary construction compound and laydown areas and temporary site access at multiple locations will result in the removal of arable farmland and vegetation. Vegetation removal will also be required to facilitate new entrances connecting to existing roads. Elsewhere, construction will include the clearance of site vegetation and some of the TPO woodland (Long Strip) for the construction of the pipeline and the jetty access road to the east of the East Site. Construction will result in temporary operations to remove and change some of the landscape elements, such as site vegetation, arable farmland, and existing areas of hard standing within the site. Construction will strengthen the industrial character of the landscape of the site and within the immediate setting. There will also be a reduction in tranquillity generally, however, this will be less pronounced due to its location adjacent to existing industrial areas. The impact is assessed as **moderate**, over a medium geographical extent, short term and temporary. This will result in a moderate adverse significant effect.	Moderate	Moderate adverse (significant)

Table 13.9: Assessment of Landscape and Seascape Effects - Operation

Landscape type	Sensitivity of receptor	Description of impact	Predicted magnitude of impact	Classification of effect
MCA 6: Humber Water	Low	The Project will introduce marine infrastructure and an industrial presence which will directly impact the MCA. Large shipping vessels are already present within the landscape however the Project will introduce additional movement and further erode the tranquillity of the character area. Large structures, such as the ammonia tank will be viewed in context with other large-scale industry and appear in context with the industrial landscape. The size and scale of the Project is proportionate in relation to the character area in general, and the key characteristics of the landscape will be retained. The impact is assessed as **low**, over a medium geographical extent, short term and temporary. This will result in a minor adverse not significant effect.	Low	Minor adverse (not significant)
LLT 1 – Industrial Landscape	Very Low	The Project will directly impact the LLT as large new structures, such as the ammonia tank, vent stack, and flare will appear on the skyline and the jetty will encroach into the Humber Estuary. The flat low-lying landscape is heavily influenced by large scale industrial works and the Project will be viewed in context with other large-scale industry. Due to presence of these large-scale structures within this LLT and the nature of the proposals, it is assessed that the Project will have a limited potential to affect the landscape character and perception of the area. Impacts will be **low**, over a medium geographical extent, long term and reversible. This will result in a minor adverse not significant effect.	Low	Minor adverse (not significant)
LLT2 – Open Farmland	Low	The Project lies outside of this LCT, however, views of the Project from open locations will be available. These will appear as distant views and within the context of existing industry. These views of industry, together with the network of high voltage pylons introduce detracting features into the landscape. It is considered that the visible structures associated with the Project will result in limited perceptible change to the landscape character and tranquillity. The impact is assessed as **negligible**, over a small geographical extent, short term and reversible. This will result in a negligible adverse not significant effect.	Negligible	Negligible adverse (not significant)

Landscape type	Sensitivity of receptor	Description of impact	Predicted magnitude of impact	Classification of effect
21B – Sunk Island	Low	The Project lies outside of this LCT but will introduce views of the Project from within. Due to expansive views containing large-scale structures including Killingholme Oil Refineries, Immingham Oil Terminal, Immingham Docks and other heavy industry, it is considered that the Project will result in limited perceptible change to the landscape character and tranquillity. The impact is assessed as **negligible**, over a small geographical extent, short term and reversible. This will result in a negligible adverse not significant effect.	Negligible	Negligible adverse (not significant)
The site and its immediate setting	Low	The Project will directly impact the site and its immediate setting as large new structures will be present where there is currently an absence of these features. The site is heavily influenced by adjacent large scale industrial works and the Project will be viewed in context with this existing large-scale industry. Due to presence of large-scale structures within this LLT, and the nature of the proposals, it is assessed that the Project will have a limited potential to affect the landscape character and perception of the characteristics. Impacts will be **minor**, over a medium geographical extent, long term and reversible. This will result in a minor adverse not significant effect.	Minor	Minor adverse (not significant)

Construction (and Decommissioning)

13.8.3 Based on the implementation of the embedded and standard mitigation measures as detailed herein, and due to the existing landscape context assessed within the baseline, the preliminary assessment identifies no significant effects on landscape or seascape receptors out with the Site at Project construction or decommissioning.

Operation

13.8.4 During Project operation, the aesthetic and perceptual qualities would remain similar to the present, with large-scale static structures visible within the wider landscape. Due to the setting of the Project, it is anticipated that there is a low likelihood that the effects would result in an inherent change to the existing landscape character at a local scale and a negligible likelihood at a regional or national scale.

13.8.5 Overall, the influence of the Project would be limited to the localised landscape immediately adjacent to the Site boundary and therefore no significant landscape or seascape effects are identified.

13.8.6 Given the scale and nature of the Project, there is limited potential for mitigation measures to further reduce operational phase effects, however, where possible and within the constraints of the Project, landscape elements would assist in assimilating the Project into the receiving landscape.

13.9 Visual Effects

13.9.1 Potential visual effects in relation to the Project in comparison with the future baseline visual context are considered in **Table 13.10** by reference to representative viewpoints – this table considers both Project construction and operation (with construction phase effects also being applicable to the decommissioning phase) and taking embedded mitigation into account. The preliminary assessments contained within **Table 13.10** should be read in conjunction with **Figures 13.1** - **13.8** (PEI Report Volume III) which illustrate the baseline situation at each viewpoint.

13.9.2 It is expected that 7 residential properties on the west side of Queens Road will need to be acquired to facilitate the Project (also refer to **Chapter 2: The Project**). For the purposes of this assessment, residential receptors have been assessed as a group within Viewpoint 11. As explained in **Chapter 22: Major Accidents and Disasters**, further assessment is required of the consequences of the operation of the hydrogen production facility on surrounding land uses in terms of major hazard planning. It is currently anticipated that the continued residential use of seven properties on the west side of Queens Road will need to cease, as residential use is unlikely to be compatible with the operation of the hydrogen production facility on the West Site. A number of businesses are also present in the same area on the west side of Queens Road. It is likely that those businesses are compatible with the operation of the hydrogen production facility. Whilst it is possible that powers to compulsorily acquire the properties or undertake appropriate works may be sought as part of the DCO, this is currently

considered unlikely The Applicant is currently in discussions with the landowners / occupiers of the seven residential properties with a view to negotiating their acquisition. Where it is not possible to acquire those properties through negotiation, acquisition powers for these properties will be sought through the DCO.

Table 13.10: Viewpoint Assessment

Viewpoint 1: PRoW PAULF06/ Cherry Cobb Sands Road				
Grid reference	**Receptor type**	**Elevation (m AOD)**	**Approx. distance from Project (km)**	**Direction of view**
523506, 418907	Users of the PRoW (recreational)	1.15	3.5	South-west
Visual susceptibility to change		**Value of view**		**Sensitivity of receptor**
Extensive and open view containing many dynamic elements including large shipping vessels. Distant views of heavy industry including large structures and tall elements. View has scenic quality due to the scale of the view and receptors are focused on the surroundings. The susceptibility is assessed to be medium.		Medium		Medium
Size/ scale, duration and reversibility of impact at construction				
Distant views of construction activity associated with the Project would be visible across the Humber Estuary. At the time of the survey, a large shipping vessel associated with the Oil Terminal obstructed views of the Site. The Site occupies a narrow field of view within an extensive and almost continuous line of industrial development along the southern coastline and construction activities are unlikely to be obvious within the view. High level construction activity, such as cranes, are likely to be visible within the view and would add additional vertical features and movement into the scene. Construction of the jetty (including dredging) is also likely to be visible, although periodically screened by the vessels. Construction of low-level landside infrastructure and pipelines is anticipated to be partially screened from view by intervening vegetation, built form and shipping activities. Due to the existing context, construction activity is unlikely to be prominent to the casual observer and would not introduce features at odds with the existing landscape character as port cranes already exist within the view. The scale of the impact is small within the view; however, the nature of the impact is adverse. Construction activity would be phased over an eleven-year period with the majority of the works described above occurring during Phase 1 (predicted to last a duration of three years). The duration is therefore short term. The overall impact at construction is assessed as a low size/scale of change in the view, over a small geographical extent, short term and reversible and of low magnitude. The sensitivity is assessed as medium and therefore, this would result in a minor adverse effect on visual amenity at this location.				

Viewpoint 1: PRoW PAULF06/ Cherry Cobb Sands Road		
Magnitude of impact at construction		Minor
Significance of effect at construction	Recreational	Minor adverse (not significant)
Size/ scale, duration and reversibility of impact at operation		
During Project operation, the in-river jetty including the marine infrastructure and the ammonia storage tank (located at the East Site) would be visible on the mid-horizon. Larger structures, including stack(s) and the ammonia storage tank would be visible against the sky. Additional large shipping vessels would be visible; however, these may also screen parts of the Project and would add movement within the Humber Estuary. The Project would increase the industrial prominence along the coastline without altering the balance of the overall view. The addition of the elements as described would not alter the character of the view due to the existing industrial context. The scale of the impact is small within the view; however, the nature of the impact is adverse. The impact of the Project would be long term and reversible for landside infrastructure and long term and permanent for marine infrastructure. The overall impact at operation is assessed as a low size/scale of change in the view, over a small geographical extent, long term and reversible and overall low magnitude. The sensitivity is assessed as medium and therefore, the Project would result in a minor adverse effect on visual amenity at this location.		
Magnitude of impact at operation		Minor
Significance of effect at operation	Recreational	Minor adverse (not significant)

Viewpoint 2: PRoW and proposed England Coast Path				
Grid reference	**Receptor type**	**Elevation (m AOD)**	**Approx. distance from Project (km)**	**Direction of view**
521648, 415263	Recreational users of PRoW (recreational)	4.7	4.79	West
Visual susceptibility to change		**Value of view**		**Sensitivity of receptor**
View containing dynamic elements associated with the Port and subject to natural coastal processes. Industrial presence and flood defences influence the view. Views contain an undeveloped arable field and mature woodland		Medium.		Medium

Viewpoint 2: PRoW and proposed England Coast Path		
belt, which are located within the Site boundary. The susceptibility is assessed to be medium.		
Size/ scale, duration and reversibility of impact at construction		
Phase 1 construction works for the Project would be visible at close to mid-range. The construction works for the Project would occupy a wide field of view, with the proposed jetty and topside infrastructure extending into the Humber to the north-east and the East Site (including the ammonia tank) located behind the trees to the west. High level construction activity, such as cranes for installations within the East Site are likely to be visible within the view and would add additional vertical features and movement into the scene. Elements such as this are already present within the view, however, these new features would be brought closer to the observer. The construction of the marine infrastructure, including dredging, would be present within the foreground and further erode tranquillity within this localised area. It is anticipated that jack-up barge(s) and other marine construction vessels would be required to facilitate the construction of the jetty and would introduce a working offshore platform and further movement and disturbance into the coastal scene. Construction of the pipelines and operational access road would also be visible from this location and would require removal of a large part of the 'Long Strip' woodland, however, the details are yet to be confirmed. In addition, site fencing and welfare facilities may also be present within the foreground. Construction activity would be phased over an eleven-year period with the majority of the works described above occurring during Phase 1 over a period of three years. The duration is therefore short term. The alterations would result in a pronounced deterioration in the existing view; therefore, the nature of the impact is adverse. The overall impact at construction is assessed as a high size/scale of change in the view, over a large geographical extent, short term and reversible and overall high magnitude. The sensitivity is assessed as medium and therefore, the Project would result in a major adverse effect (which is significant) on visual amenity at this location.		
Magnitude of impact at construction		Major
Significance of effect at construction	Recreational	Major adverse (significant)
Size/scale, duration and reversibility of impact at operation		
Installations, such as the ammonia tank, and structures associated with East Site are expected to be visible from this location and form dominant new features across the skyline. A large part of the existing TPO woodland in Long Strip along the bridleway/ PRoW is anticipated to be removed to facilitate the operational access route to the jetty, pipelines and maintenance track, however some woodland is expected to be retained which should still provide some screening for views from the east. The jetty would be visible from this location, although would not add a feature not already present or characteristic of the view. Additional shipping vessels would add further movement to the already dynamic coastline. The ammonia pipeline from the jetty to the East Site is proposed to be above ground and stacked vertically. Views of this pipeline are likely to be visible from this location.		

Viewpoint 2: PRoW and proposed England Coast Path		
The alterations would result in a noticeable deterioration in the view and therefore the nature of the impact is adverse. The impact could be lessened by introducing planting along the coastal route (such as a native trees, hedge, and/ or woodland belt) where possible and within the constraints of the Project. Users of the PRoW would experience transient views whilst using the PRoW, where the effects would be less visible along the wider route as a result of distance, intervening features, and direction of view. The overall impact at operation is assessed as a medium size/scale of change in the view, over a medium geographical extent, long term and reversible (landside) and permanent (marine) and hence overall medium magnitude. The sensitivity is assessed as medium and therefore, the Project would result in a moderate adverse effect (which is significant) on visual amenity at this location.		
Magnitude of impact at operation		Moderate
Significance of effect at operation	Recreational	Moderate adverse (significant)

Viewpoint 3: Bridleway/ PRoW and proposed England Coast Path				
Grid reference	**Receptor type**	**Elevation (m AOD)**	**Approx. distance from Project (km)**	**Direction of view**
521311, 415505	Recreational users of the bridleway/ PRoW	5.5	Adjacent to the Site boundary	South-east
Visual susceptibility to change		**Value of view**		**Sensitivity of receptor**
View containing dynamic elements associated with the Port and subject to natural coastal processes. Industrial presence such as the Stallingborough chemical plant and flood defences influence the view. The view has a scenic quality albeit the detracting features. The susceptibility is assessed to be medium.		Medium		Medium
Size/ scale, duration and reversibility of impact at construction				
Views of construction activity associated with the Project would be visible at close to mid-range. The Project would occupy a wide field of vision within this view, with the proposed jetty extending into the Humber to the north-east. The section of the bridleway/ PRoW along the east of the East Site is likely to be diverted during the construction phase until the plant is operational. High level construction activity, such as cranes for installations within the East Site are likely to be visible and would add additional vertical features and movement into the scene. The construction of the marine infrastructure, including dredging, would be present within the foreground and further erode tranquillity within this localised area. It is anticipated that jack-up				

Viewpoint 3: Bridleway/ PRoW and proposed England Coast Path		
barge(s) would be required to facilitate the construction of the jetty and would introduce a working offshore platform with further movement and disturbance into the coastal scene. Construction of the pipelines and access road would be visible from this location and include tree loss within 'Long Strip' woodland. The details on the amount of tree loss is yet to be confirmed. Additional impacts arising from the clearance of surface vegetation and digging of open trenches within the field to the foreground. In addition, site fencing and welfare facilities may also be present within the scene. Construction activity is likely to dominate the scene. As described above, the bridleway/ PRoW is likely to be diverted or closed during the construction of the Project for safety reasons and reopened following the completion of Phase 1. Construction activity would be phased over an eleven-year period with the majority of the works described above occurring during Phase 1 over a period of three years. The duration is therefore short term. The overall impact at construction is assessed as a high size/scale of change in the view, over a large geographical extent, short term and reversible and hence overall high magnitude. The sensitivity is assessed as medium and therefore, the Project would result in a major adverse effect (which is significant) on visual amenity at this location.		
Magnitude of impact at construction		Major
Significance of effect at construction	Recreational	Major adverse (significant)
Size/ scale, duration and reversibility of impact at operation		
Installations, such as the ammonia tank, and structures associated with the East Site are expected to be visible from this location on the periphery of the view. At least some of the existing woodland along the bridleway/ PRoW is expected to be retained which would allow for some screening of the industrial installations. The jetty would be visible from this location, alongside the existing jetty. Additional shipping vessels would add further movement and disturbance to the already dynamic coastline. The field shown within the foreground would be restored following the construction of Phase 1, however, the proposals remain under development. The impact of the Project is long term and reversible for landside infrastructure and long term and permanent for marine infrastructure. The Project would result in a noticeable deterioration in the view and the nature of the impact is assessed as adverse. The impact could be lessened by introducing planting along the coastal route (such as a native trees, hedge, and/ or woodland belt), where possible within the constraints of the Project. The viewpoint represents the worst-case scenario and is located at the closest point to the Project. Recreational receptors would experience transient views whilst using the PRoW, where the effects would be less visible as a result of intervening features and direction of view. The view from this location is likely to be orientated towards the Humber Estuary and activity associated with it. The overall impact at operation is assessed as a medium size/scale of change in the view, over a medium geographical extent, long term and reversible and hence of overall medium magnitude. The sensitivity is assessed as medium and therefore, the Project would result in a moderate adverse effect (which is significant) on visual amenity at this location.		
Magnitude of impact at operation		Moderate

Viewpoint 3: Bridleway/ PRoW and proposed England Coast Path		
Significance of effect at operation	Recreational	Moderate adverse (significant)

Viewpoint 4: Queen's Road				
Grid reference	**Receptor type**	**Elevation (m AOD)**	**Approx. distance from Project (km)**	**Direction of view**
520221, 414743	Motorised users of the road and commercial receptors.	2.2	Less than 0.1km from the Site boundary	Viewpoint 4a – north-east. Viewpoint 4b – south-west.
Visual susceptibility to change		**Value of view**		**Sensitivity of receptor**
View along Queen's Road containing both rural and urban elements. Detracting features such as Queen's Road Power Station. Receptors assessed as having a low susceptibility to change. The susceptibility is assessed to be low.		Low.		Low
Size/ scale, duration and reversibility of impact at construction				
Views of construction activity associated with the Project would be visible at close to mid-range. The Project would occupy a wide field of vision within this view to the north-east and south-west. High level construction activity, such as cranes for installations within the East Site would be visible behind the trees and against the skyline. Lower-level construction activity associated with the East Site is likely to be screened by existing intervening vegetation. Construction activity associated with the West Site and hydrogen pipeline is likely to be noticeable within the view with machinery, site welfare cabins, fencing and heavy vehicles present within the foreground. Pipeline construction could include the clearing of surface vegetation and the digging of open trenches within the field to the foreground, however, details are yet to be confirmed. The construction of the marine infrastructure is unlikely to be visible from this location. Construction activities are likely to result in a noticeable deterioration in the view and the nature of the impact is assessed as adverse. Construction activity would be phased over an eleven-year period with the majority of the works described above occurring during Phase 1 over a period of three years. The duration is therefore short term. The overall impact at construction is assessed as a medium size/scale of change in the view, over a medium geographical extent, short term and reversible and hence of overall medium magnitude. The sensitivity is assessed as low and therefore, the Project would result in a moderate adverse effect (which is significant) on visual amenity at this location.				
Magnitude of impact at construction				Moderate

Viewpoint 4: Queen's Road		
Significance of effect at construction	Local road users and commercial	Moderate adverse (significant)
Size/ scale, duration and reversibility of impact at operation		
Installations, such as the ammonia tank, and structures associated with East Site are expected to be visible from this location and would be visible on the skyline. Installations associated with the West Site are also likely to be visible from this location to the south west. The Project would introduce large new structures into the scene which would increase the industrial presence within this localised area. The Project is not out of context within the receiving landscape, however, would introduce built form which would enclose the view to the south-west. The Project is likely to result in a deterioration in the view with the addition of large detracting elements. The impact of the Project is long term, reversible and adverse. The overall impact at operation is assessed as a low size/scale of change in the view, over a medium geographical extent, long term and reversible hence low magnitude. The sensitivity is assessed as low and therefore, the Project would result in a minor adverse effect on visual amenity at this location.		
Magnitude of impact at operation		Minor
Significance of effect at operation	Motorised users and commercial	Minor adverse (not significant)

Viewpoint 5: Public Right of Way to the east of Immingham				
Grid reference	**Receptor type**	**Elevation (m AOD)**	**Approx. distance from Project (km)**	**Direction of view**
519289, 414779	Users of the Public Right of Way	2.12	0.5km	East
Visual susceptibility to change		**Value of view**		**Sensitivity of receptor**
PRoW crosses a medium sized arable field. Detracting features present within the scene include overhead pylons, industrial building and power station. Receptors are assessed as having a medium susceptibility to the changes arising from the Project.		Low		Medium
Size/ scale, duration and reversibility of impact at construction				
Views of high-level construction activity, such as cranes for installations within the East Site and West Site would be visible behind the trees on the horizon. Lower-level construction activity				

Viewpoint 5: Public Right of Way to the east of Immingham		
associated with the West Site is likely to be screened by existing intervening vegetation along King's Road (A1173). Low-level construction activity associated with the East Site, marine infrastructure and pipelines is unlikely to be visible from this location due to the distance of the receptor and intervening vegetation and surface features. The addition of cranes into the landscape would add to the existing vertical and detracting features, however, would remain in context with the landscape character. Construction activity would be phased over an eleven-year period with the majority of the works described above occurring during Phase 1 over a period of three years. The duration is therefore short term. Construction activities are likely to result in a limited deterioration of the view, however, the nature of the impact is adverse. The overall impact at construction is assessed as low size/scale of change in the view, over a small geographical extent, short term and reversible and overall low magnitude. The sensitivity is assessed as medium and therefore, the Project would result in a minor adverse effect on visual amenity at this location.		
Magnitude of impact at construction		Minor
Significance of effect at construction	Recreational	Minor adverse (not significant)
Size/ scale, duration and reversibility of impact at operation		
Installations, such as the ammonia tank, and structures associated with East Site are expected to be visible on the skyline. Installations associated with the West Site are also likely to be visible from this location. Together these would extend the existing vertical features across the skyline. The Project would introduce additional large new structures into the scene which would increase the industrial presence within this localised area. The Project is not out of context within the receiving landscape, however, would extend the existing detracting features across the horizon. The impact of the Project is long term and reversible. The Project is likely to result in a limited deterioration of the view, however, the nature of the impact is adverse. The overall impact at operation is assessed as a low size/scale of change in the view, over a small geographical extent, long term and reversible and hence low magnitude. The sensitivity is assessed as medium and therefore, the Project would result in a minor adverse effect on visual amenity at this location.		
Magnitude of impact at operation		Minor
Significance of effect at operation	Recreational	Minor adverse (not significant)

Viewpoint 6: Public Right of Way to the rear of Ings Lane/Talbot Road				
Grid reference	**Receptor type**	**Elevation (m AOD)**	**Approx. distance from Project (km)**	**Direction of view**
519048, 414526	Residents	1.98	0.7km	North-east
Visual susceptibility to change		**Value of view**		**Sensitivity of receptor**
PRoW located to the rear of houses on Ings Lane and Talbot Road. The susceptibility of the receptor is assessed to be medium to high.		Low		Medium
Size/ scale, duration and reversibility of impact at construction				
Views of high-level construction activity, such as cranes for installations within the East Site and West Site may be partially visible behind the trees on the horizon. Lower-level construction activity associated with the East Site and West Site would be screened by existing intervening vegetation including a block of woodland. All construction activity associated with the marine infrastructure and pipeline is unlikely to be visible from this location due to the distance of the receptor and intervening vegetation and surface features. The addition of cranes into the landscape would contribute additional vertical and detracting features into the scene, however, these are in context with the landscape character. Construction activity would be phased over an eleven-year period with the majority of the works described above occurring during Phase 1 over a period of three years. The duration is therefore short term. Construction activity is likely to result in a change barely perceptible within the view. The overall impact at construction is assessed as very low size/scale of change in the view, over a very small geographical extent, short term and reversible and hence very low magnitude. The sensitivity is assessed as medium and therefore, the Project would result in a negligible adverse effect on visual amenity at this location.				
Magnitude of impact at construction				Negligible
Significance of effect at construction		Residential and recreational		Negligible adverse (not significant)
Size/ scale, duration and reversibility of impact at operation				
Installations, such as the ammonia tank, and taller structures associated with East and West Site would be partially visible on the skyline, however, intervening vegetation would assist in screening some of these elements. The Project would introduce large new structures into the scene, although these may not be immediately apparent to the casual observer due to the proximity of the receptor from these structures. The Project is not out of context within the receiving landscape, however, would increase the presence of detracting features within the horizon where views allow. The impact of the Project is long term and reversible. The Project is likely to result in a barely perceptible deterioration of the existing view, however, the nature of the impact is assessed as adverse.				

Viewpoint 6: Public Right of Way to the rear of Ings Lane/Talbot Road		
The overall impact at operation is assessed as a very low size/scale of change in the view, over a very small geographical extent, long term and reversible and very low magnitude. The sensitivity is assessed as medium and therefore, the Project would result in a negligible adverse effect on visual amenity at this location.		
Magnitude of impact at operation		Negligible
Significance of effect at operation	Residential and recreational	Negligible adverse (not significant)

Viewpoint 7: Public Right of Way to the north east of Mauxhall Farm				
Grid reference	**Receptor type**	**Elevation (m AOD)**	**Approx. distance from Project (km)**	**Direction of view**
519090, 413323	Users of PRoW/recreational	3.2	1.2km	North-east
Visual susceptibility to change		**Value of view**		**Sensitivity of receptor**
PRoW located within large arable fields. The susceptibility of the receptor is assessed to be medium to high as attention is focused on the enjoyment of the countryside.		Low		Medium
Size/ scale, duration and reversibility of impact at construction				
Views of high-level construction activity, such as cranes for installations within the East Site and West Site are likely to be visible within the horizon. Lower-level construction activity associated with the West Site would be screened by existing intervening vegetation and built form. All construction activity associated with the marine infrastructure and pipeline is unlikely to be visible from this location due to the distance of the receptor and intervening vegetation and surface features. The addition of cranes into the landscape would contribute additional vertical and detracting features into the scene, however, these are in context with the landscape character. Within the narrow field of vision, where the Project would be visible, there are existing overhead pylons and vertical features. Construction activity would be phased over an eleven-year period with the majority of the works described above occurring during Phase 1 over a period of three years. The duration is therefore short term. Construction activity is likely to result in a change barely perceptible within the view. The overall impact at construction is assessed as a very low size/scale of change in the view, over a very small geographical extent, short term and reversible and very low magnitude. The sensitivity is assessed as medium and therefore, the Project would result in a negligible adverse effect on visual amenity at this location.				
Magnitude of impact at construction				Negligible

Viewpoint 7: Public Right of Way to the north east of Mauxhall Farm		
Significance of effect at construction	Residential	Negligible adverse (not significant)
Size/ scale, duration and reversibility of impact at operation		
Installations, such as the ammonia tank, and taller structures associated with East and West Site has the potential to be partially visible on the skyline within a narrow extent along the horizon. The Project would introduce large new structures into the scene, although these may not be immediately apparent to the casual observer due to the proximity of the receptor from these structures. The Project is not out of context within the receiving landscape, however, the presence of detracting features within the horizon would be increased. The impact of the Project is long term and reversible. The Project is likely to result in a barely perceptible deterioration of the existing view. The overall impact at operation is assessed as a very low size/scale of change in the view, over a very small geographical extent, long term and reversible and hence very low magnitude. The sensitivity is assessed as medium and therefore, the Project would result in a negligible adverse effect on visual amenity at this location.		
Magnitude of impact at operation		Negligible
Significance of effect at operation	Residential	Negligible adverse (not significant)

Viewpoint 8: Public Right of Way to the north east of Stallingborough				
Grid reference	**Receptor type**	**Elevation (m AOD)**	**Approx. distance from Project (km)**	**Direction of view**
520649, 412061	Users of PRoW and residents	1.8	2.4km	North
Visual susceptibility to change		**Value of view**		**Sensitivity of receptor**
PRoW located within large arable fields with scattered areas of scrub and some mature trees along boundaries. Receptors have open rural views, however, influenced by pylons and distant industry on the horizon. The susceptibility of the receptor is assessed to be medium to high.		Low		Medium
Size/ scale, duration and reversibility of impact at construction				
Views of high-level construction activity, such as cranes for installations within the East Site and West Site are likely to be visible behind mature vegetation on the horizon. Lower-level construction activity associated with the Project would be screened by existing intervening vegetation and built form.				

Viewpoint 8: Public Right of Way to the north east of Stallingborough		
All construction activity associated with the marine infrastructure and pipeline is unlikely to be visible from this location due to the distance of the receptor and intervening vegetation and surface features. The addition of cranes into the landscape would contribute additional vertical and detracting features into the scene, however, these are in context with the landscape character. Construction activity would be phased over an eleven-year period with the majority of the works described above occurring during Phase 1 over a period of three years. The duration is therefore short term. Construction activity is likely to result in a change barely perceptible within the view. The overall impact at construction is assessed as a very low size/scale change in the view, over a very small geographical extent, short term and reversible and hence very low magnitude. The sensitivity is assessed as medium and therefore, the Project would result in a negligible adverse effect on visual amenity at this location.		
Magnitude of impact at construction		Negligible
Significance of effect at construction	Residential and recreational	Negligible adverse (not significant)
Size/ scale, duration and reversibility of impact at operation		
Installations, such as the ammonia tank, and taller structures associated with East and West Site has the potential to be partially visible on the skyline although mature intervening vegetation would screen a large proportion of the Project. The Project would introduce large new structures into the scene, although these may not be immediately apparent to the casual observer due to the distance proximity of the receptor from these structures and the scale of other detracting features closer to the receptor. The Project is not out of context within the receiving landscape, however, the presence of detracting features within the horizon would increase. The impact of the Project is long term and reversible. The Project is likely to result in a barely perceptible deterioration of the existing view. The overall impact at operation is assessed as a very low size/scale of change in the view, over a very small geographical extent, long term and reversible and hence very low magnitude. The sensitivity is assessed as medium and therefore, the Project would result in a negligible adverse effect on visual amenity at this location.		
Magnitude of impact at operation		Negligible
Significance of effect at operation	Residential and recreational	Negligible adverse (not significant)

Viewpoint 9: B1210 adjacent to railway line				
Grid reference	**Receptor type**	**Elevation (m AOD)**	**Approx. distance from Project (km)**	**Direction of view**
518447, 412430	Local users of the road/ users of the railway	3.6	2.4km	North
Visual susceptibility to change		**Value of view**		**Sensitivity of receptor**
Road and railway travelling through a flat landscape with open views across large arable fields. Vegetation cover is generally low. Overhead wires and pylons traverse the landscape and various industrial facilities, and mature trees enclose the horizon. The susceptibility of the receptor is assessed to be low.		Low		Low
Size/ scale, duration and reversibility of impact at construction				
Views of high-level construction activity, such as cranes for installations within the East Site and West Site are likely to be visible behind mature vegetation and existing structures on the horizon. Lower-level construction activity associated with the Project would be screened by existing intervening vegetation and built form. All construction activity associated with the marine infrastructure and pipeline is unlikely to be visible from this location due to the distance of the receptor and intervening vegetation and surface features. The addition of cranes into the landscape would contribute additional vertical and detracting features into the scene, however, these are in context with the landscape character. Construction activity would be phased over an eleven-year period with the majority of the works described above occurring during Phase 1 over a period of three years. The duration is therefore short term. Construction activity is likely to result in a change barely perceptible within the view. The overall impact at construction is assessed as a very low size/scale of change in the view, over a very small geographical extent, short term and reversible and hence low magnitude. The sensitivity is assessed as low and therefore, the Project would result in a negligible adverse effect on visual amenity at this location.				
Magnitude of impact at construction				Negligible
Significance of effect at construction		Road and railway users		Negligible adverse (not significant)
Size/ scale, duration and reversibility of impact at operation				
Installations, such as the ammonia tank, and taller structures associated with East and West Site has the potential to be partially visible on the skyline although mature intervening vegetation would screen a large proportion of the development.				

Viewpoint 9: B1210 adjacent to railway line		
The Project would introduce large new structures into the scene, although these may not be immediately apparent to the casual observer due to the proximity of the receptor from these structures and the scale of the development in relation to similar developments. The Project is not out of context within the receiving landscape, however, the presence of detracting features within the horizon would increase. The impact of the Project is long term and reversible. The Project is likely to result in a barely perceptible deterioration of the existing view. The overall impact at operation is assessed as a very low size/scale of change in the view, over a very small geographical extent, long term and reversible and hence very low magnitude. The sensitivity is assessed as low and therefore, the Project would result in a negligible adverse effect on visual amenity at this location.		
Magnitude of impact at operation		Negligible
Significance of effect at operation	Road and railway users	Negligible adverse (not significant)

Viewpoint 10: Public Right of Way and proposed England Coast Path				
Grid reference	**Receptor type**	**Elevation (m AOD)**	**Approx. distance from Project (km)**	**Direction of view**
518160, 417989	Users of the PRoW	3.6	3.5km	South-east
Visual susceptibility to change		**Value of view**		**Sensitivity of receptor**
Users of the coastal path travelling south along the flood defences. Views are open and extensive across the Humber Estuary. Industry both marine and landside is dominant and erodes tranquillity. The susceptibility of the receptor is assessed to be medium due to the nature of the views.		Low		Medium to low
Size/ scale, duration and reversibility of impact at construction				
Views of high-level construction activity, such as cranes for installations within the East Site and for the marine infrastructure has the potential to be visible behind the existing structures associated with the Oil Terminal. Lower-level construction activity associated with the Project would be screened by built form and intervening vegetation. Construction activity associated with the pipelines would not be visible due to large intervening surface features. The addition of cranes into the landscape would contribute additional vertical and detracting features into the scene, however, these are in context with the landscape character and would not be discernible within the existing context.				

Viewpoint 10: Public Right of Way and proposed England Coast Path		
Construction activity would be phased over an eleven-year period with the majority of the works described above occurring during Phase 1 over a period of three years. The duration is therefore short term. Construction activity is likely to result in a change barely perceptible within the view. The overall impact at construction is assessed as a very low size/scale of change in the view, over a small geographical extent, short term and reversible and hence very low magnitude. The sensitivity is assessed as medium to low and therefore, the Project would result in a negligible adverse effect on visual amenity at this location.		
Magnitude of impact at construction		Negligible
Significance of effect at construction	Recreational	Negligible adverse (not significant)
Size/ scale, duration and reversibility of impact at operation		
Installations, such as the ammonia tank, and taller structures associated with the East Site has the potential to be visible on the skyline although existing intervening mature vegetation would screen a large proportion of the Project. The Project would introduce large new structures into the scene, although these may not be immediately apparent to the casual observer due to the presence of similar industrial elements across the view. The Project is not out of context within the receiving landscape. The impact of the Project is long term and reversible. The Project is likely to result in a barely perceptible deterioration of the existing view. The overall impact at operation is assessed as a very low size/scale, over a small geographical extent, long term and reversible and hence very low magnitude. The sensitivity is assessed as medium to low and therefore, the Project would result in a negligible adverse effect on visual amenity at this location.		
Magnitude of impact at operation		Negligible
Significance of effect at operation	Recreational	Negligible adverse (not significant)

Viewpoint 11: Kings Road				
Grid reference	**Receptor type**	**Elevation (m AOD)**	**Approx. distance from Project (km)**	**Direction of view**
519676 414814	Residents of properties on Queens Road	2	>10m	East
Visual susceptibility to change		**Value of view**		**Sensitivity of receptor**
Residential receptors located at close proximity to the West Site. Views of the Project are likely from first floor windows and principle living areas in locations where intervening boundary features do not exist. It is		Low		Medium

Viewpoint 11: Kings Road		
assessed that the susceptibility of the residential receptors is high due to the nature of the receptor and proximity to the Project. It is expected that these residential receptors will be acquired to facilitate the Project.		
Size/ scale, duration and reversibility of impact at construction		
Potential views of construction activity associated with the West Site is expected to be visible at close to mid-range and would extend across the entire view to the rear of the residential receptors. High-level construction activity associated with the East Site may be visible in the distance to the north, and construction activity associated with the pipeline may be visible east where there are no intervening landscape elements or built form. Construction activity associated with the West Site is likely to be noticeable within the view to the rear of the residencies with machinery, site welfare cabins, fencing and heavy vehicles present within the foreground. Pipeline construction may include the clearing of surface vegetation and the digging of open trenches within the field to the foreground, however, details are yet to be confirmed. Construction activity would be phased over an eleven-year period with the majority of the works occurring during Phase 1 over a period of three years. Construction activity during Phases 2 to 6 occur over a seven-year period and include the additions of converters and liquefiers within the East and West Sites. The duration is therefore short term. Construction activities are likely to result in a noticeable deterioration in the view to the west of the residential receptors over a large area and at close proximity to the receptor. The nature of the impact is assessed as adverse. The overall impact at construction is assessed as a high size/scale change in the view, over a large geographical extent, short term and reversible and hence high magnitude. The sensitivity is assessed as medium and therefore, the Project would result in a major adverse effect (which is significant) on visual amenity at this location.		
Magnitude of impact at construction		Major
Significance of effect at construction	Residential	Major adverse (significant)
Size/ scale, duration and reversibility of impact at operation		
Installations, such as the ammonia tank, and taller structures associated with East Site may be visible on the skyline although mature intervening vegetation and built form would screen a large proportion of the development. These structures may not be immediately apparent to the casual observer due to the presence of similar industrial elements across the view. Installations associated with the West Site would be visible to the rear (west) of the residential receptors across the entire view introducing detracting features to the foreground of the view. The impact of the Project is long term and reversible; however, the Project would introduce additional detracting features into an area which is currently largely undeveloped. This is likely to result in a noticeable deterioration of the existing view immediately apparent to the receptor. The overall impact at operation is assessed as a high size/scale of change in the view, over a large geographical extent, long term and reversible and hence high magnitude. The sensitivity is assessed as medium and therefore, the Project would result in a major adverse effect (which is significant) on visual amenity at this location.		

Viewpoint 11: Kings Road		
Magnitude of impact at operation		Major
Significance of effect at operation	Residential	Major adverse (significant)

Construction (and Decommissioning)

13.9.3 It is considered that during Project construction (and decommissioning) there would be changes in the view through the addition of detracting visual features associated with the construction process and the introduction of new large-scale structures at various stages of development. The visual effects at the construction stage are assessed to be short term and reversible.

13.9.4 As detailed in **Table 13.7**, the preliminary assessment indicates that potential significant adverse visual amenity effects could be experienced at a number of representative viewpoints as follows in the construction phase:

a. Viewpoint 2 (PRoW and proposed English Coastal Path).

b. Viewpoint 3 (PRoW and proposed English Coastal Path).

c. Viewpoint 4 (Queen's Road).

d. Viewpoint 11 (Residential receptors located on Queens Road).

Operation

13.9.5 The visibility of the Project across a large extent of the study area is likely due to limited intervening vegetation and built form within a flat landscape. The Project would introduce new, large structures and vertical elements into a landscape where these features are already present. When viewed from within the landscape, these new structures would be viewed within the context of existing similar structures within relatively close proximity.

13.9.6 The introduction of this industrial development within a substantial landscape framework would not be uncharacteristic when set within the existing attributes of the local receiving landscape. This includes the existing development and infrastructure.

13.9.7 The visual effects at operation are assessed to be long term and reversible for landside infrastructure and permanent for marine infrastructure.

13.10 Mitigation and Enhancement Measures

13.10.1 The opportunity for mitigation of the significant visual effects of the Project is limited due to the size and scale of the proposed structures. No additional mitigation is proposed at this stage due to the developing design, however, the suggested mitigation measures outlined below may assist in assimilating the Project into the receiving landscape subject to the constraints of the Project.

13.10.2 Mitigation will be implemented during construction to ensure the protection of retained trees with appropriate root protection areas, and these will be clearly marked in the CEMP.

13.10.3 Suggested mitigation within a 15-year assessment period:

a. Planting to reinforce the existing vegetation, where appropriate, would provide denser effective winter visual barrier.

b. Any newly planted tree belts and hedgerow trees would be protected using suitable protection methods to enable successful establishment.

c. External appearance, including colour, materials and surface finishes of permanent buildings and structures to be considered.

13.10.4 These mitigation measures would help partially mitigate views of the Project elements and assimilate it into the surrounding landscape. When seen within the context of the wider landscape, for some viewpoints, the proposals would seem less noticeable at year 15 compared to year 1. However, as detailed in **Table 13.7**, the preliminary assessment indicates that given the scale of visible elements potential significant adverse visual amenity effects would persist at year 15 and could be experienced at a number of representative viewpoints during the Project operational phase as follows:

a. Viewpoint 2 (PRoW and proposed English Coastal Path).

b. Viewpoint 3 (PRoW and proposed English Coastal Path).

c. Viewpoint 11 (Residential receptors located on Queens Road).

13.11 Preliminary Assessment of Residual Effects

13.11.1 The assessment has determined that receptors at Viewpoints 2, 3, 4 and 11 are likely to experience significant short-term adverse effects during construction as a result of the close distance and limited intervening vegetation.

13.11.2 The impact on receptors at Viewpoint 4 (motorised and commercial receptors at Queens Road) would reduce to not significant during operation. Effects are likely to remain significant for the remaining receptors at Viewpoints 2, 3, and 11 due to the sensitivity of these receptors (recreational and residential) and the close distance of these receptors to the Project. Viewpoints 2 and 3 are located within a short distance from each other and represent the worst-case scenario for transient views experienced by recreational receptors using the England Coast Path and bridleway.

13.11.3 As the design development evolves for the Project it is recommended that options for mitigation in the form of additional landscape features are to be explored.

13.12 Summary of Preliminary Assessment

13.12.1 **Table 13.11** provides a summary of the likely significant landscape/ seascape and visual effects associated with the Project. This illustrates that the preliminary landscape/ seascape assessment has not identified any significant effects during the construction phase and operation of the Project. The preliminary visual

amenity assessment indicates that some representative viewpoints would experience potential significant effects during Project construction, operation and decommissioning.

13.12.2 The landscape and seascape character and visual amenity effects associated with the Project will be re-evaluated and reported within the ES following the confirmation of the Project design details and mitigation features.

Table 13.11: Summary of Preliminary Assessment – Likely Significant Effects

Receptor Reference	Receptor Location	Receptor Type	Significance of Effect	
			Construction (and Decommissioning)	Operation
Landscape/ Seascape				
No identified significant effects on landscape and seascape receptors				
Visual Amenity				
2	PRoW and proposed England Coast Path route	Recreational	**Major adverse (significant)**	**Moderate adverse (significant)**
3	Bridleway/ PRoW and proposed England Coast Path Route	Recreational	**Major adverse (significant)**	**Moderate adverse (significant)**
4	Queens Road	Motorised users and commercial receptors	**Moderate adverse (significant)**	Minor adverse (not significant)
11	Kings Road, Immingham	Residential receptors located on Queens Road	**Major adverse (significant)**	**Major adverse (significant)**

Table 13.12: Summary of potential impact, mitigation measures and residual effects

Development Stage	Environmental effect (following development design and impact avoidance measures)	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s) (Long term (Lt)/ Medium term (Mt)/ Short term (St) and Permeant (P)/ Temporary (T)
Construction	Impact on recreational users at viewpoint 2 PRoW and proposed England Coast Path Route	Major adverse (significant)	No current proposals for mitigation or enhancement	Major adverse (significant)	St/T
Construction	Impact on recreational users at viewpoint 3 bridleway/ PRoW and proposed England Coast Path Route	Major adverse (significant)	Likely diversion or closure of bridleway/ PRoW	Moderate adverse (significant)	St/T
Construction	Impact on users of Queens Road and commercial receptors	Moderate adverse (significant)	No current proposals for mitigation or enhancement	Moderate adverse (significant)	St/T
Construction	Impact on residential receptors located on Queens Road	Major adverse (significant)	No current proposals for mitigation or enhancement	Major adverse (significant)	St/T
Operation	Impact on recreational users at viewpoint 2 PRoW and proposed England Coast Path Route	Moderate adverse (significant)	No current proposals for mitigation or enhancement	Moderate adverse (significant)	Lt/T

Development Stage	Environmental effect (following development design and impact avoidance measures)	Classification of effect prior to mitigation	Mitigation/ enhancement (if identified)	Classification of residual effect after mitigation	Nature of effect(s) (Long term (Lt)/ Medium term (Mt)/ Short term (St) and Permeant (P)/ Temporary (T)
Operation	Impact on recreational users at viewpoint 3 bridleway/ PRoW and proposed England Coast Path Route	Moderate adverse (significant)	No current proposals for mitigation or enhancement	Moderate adverse (significant)	Lt/T
Operation	Impact on residential receptors located on Queens Road	Major adverse (significant)	No current proposals for mitigation or enhancement, however, options for landscape buffer to be explored as intervening landscape features would help to screen the development located on the West Site	Major adverse (significant), however, intervening landscape features may assist in screening the development and reduce significant effects	Lt/T

13.13 References

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13.14 Abbreviations and Glossary of Terms

Table 13.13: Glossary and Abbreviations

Term	Acronym	Meaning
Above Ground Level	AGL	A measurement of height from the natural grade of a site to the highest point of a structure.
Above Ordnance Datum	AOD	A measurement of height from Ordnance Datum Newlyn to the highest point of a structure.
Construction Environmental Management Plan	CEMP	A Construction Environmental Management Plan describes the specific mitigation measures to be followed by the appointed construction contractor to reduce potential nuisance impacts.
Department for Environment, Food and Rural Affairs	Defra	The Government department responsible for policy and regulations on environmental, food and rural issues. The department's priorities are to grow the rural economy, improve the environment and safeguard animal and plant health.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Development plan documents	DPD	Documentation which seeks to guide development and planning in a local authority area for a set period of time.
Digital Terrain Model	DTM	A digital terrain model is a 3D representation of a terrain's surface.
East Riding of Yorkshire Council	ERYC	The ERYC has administrative control over the East Riding of Yorkshire.
England Coast Path	ECP	The English Coast Path will be the longest coastal path in the world. It will go all the way around the coast of England and will be 2,795 miles long when it is complete.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
European Landscape Convention	ELC	The European Landscape Convention (ELC) promotes the protection, management and planning of European landscapes and organises European co-operation on landscape issues
European Marine Site	EMS	European Marine Sites are areas at sea, partly or completely covered by tidal water, which are protected by European law.

Term	Acronym	Meaning
	FPCR	A leading design and environmental practice working extensively in the UK and with projects worldwide.
Guidelines for Landscape and Visual Impact Assessment	GLVIA	Provided advice on assessing the landscape and the visual impacts of development projects.
Heavy Goods Vehicle	HGV	A large truck for transporting goods.
Immingham Eastern Ro-Ro Terminal	IERRT	The proposed ro-ro facility.
Kilometre	km	A unit of measurement equal to 1000 metres.
Landscape and Biodiversity Management and Enhancement Plan	LBMEP	The LBMEP will present proposals for landscape planting, including within the construction laydown areas.
Landscape Character Areas	LCA	Referred to within North Lincolnshire Council administrative boundary
Landscape Character Type	LCT	Referred to within North Lincolnshire Council administrative boundary
Local Landscape Type	LLT	Tracts of land which share similar combinations of soils, land use, field boundaries and tree and woodland cover.
Local Wildlife Site	LWS	Non-statutory sites of nature conservation value that have been designated 'locally'. These sites are referred to differently between counties with common terms including site of importance for nature conservation, county wildlife site, site of biological importance, site of local importance and sites of metropolitan importance.
Long Strip		The triangle area of land off Queens Road and the band of mature deciduous woodland spanning Laporte Road
Long term	Lt	Nature of effect lasting 10+ years.
Marine Management Organisation	MMO	The Marine Management Organisation is an executive non-departmental public body in the United Kingdom established under the Marine and Coastal Access Act 2009, with responsibility for English waters.
Medium term	Mt	Nature of effect lasting 5-10 years.
Metre	m	A unit of measurement

Term	Acronym	Meaning
Ministry of Housing, Communities and Local Government	MHCLG	Ministry of Housing, Communities & Local Government is now called Department for Levelling Up, Housing and Communities which supports communities across the UK to thrive making them great places to live and work.
Multi-Agency Geographic Information Service	MAGIC	A website which provides geographic information about the natural environment.
National Character Area	NCA	There are 159 National Character Areas and they follow natural, rather than administrative, boundaries. They are defined by Natural England, the UK government's advisors on the natural environment.
National House-Building Council	NHBC	The National House Building Council, usually known as the NHBC, states its primary purpose as raising the construction standards of new homes in the United Kingdom
National Planning Policy Framework	NPPF	A planning framework which sets out the Government's planning policies for England and how these are expected to be applied.
National Planning Practice Guidance	NPPG	This is a web-based resource used to support the National Planning Policy Framework.
National Policy Statement	NPS	Statements prepared and designated by the Secretary of State under the Planning Act 2008, which establish national policy for Nationally Significant Infrastructure Projects, including energy, transport and water, waste water and against which applications for Development Consent Orders are assessed.
National Policy Statement for Ports	NPSfP	The National Policy Statement for Ports provides the framework for decisions on proposals for new port development.
Nationally Significant Infrastructure Project	NSIP	A type of project listed in the Planning Act 2008, which must be consented by a Development Consent Order.
No View	nv	No views of The Project from a viewpoint location.
North East Lincolnshire Council NELC	NELC	The site falls within the administrative boundary of the North East Lincolnshire Council.
North Lincolnshire Council	NLC	The site partially falls within the administrative boundary of the North Lincolnshire Council.
Ordnance Survey	OS	The national mapping agency for the UK.

Term	Acronym	Meaning
Permanent	P	A lasted or intending to last or remain unchanged indefinitely.
Preliminary Environmental Information	PEI	The information referred to in Part 1 of Schedule 4 of the EIA Regulations that has been reasonably compiled by the applicant and is reasonably required to assess the environmental effects of a project.
Preliminary Environmental Information Report	PEIR	The information referred to in Part 1 of Schedule 4 of the EIA Regulations that has been reasonably compiled by the applicant and is reasonably required to assess the environmental effects of a project.
Public Right of Way	PRoW	A highway where the public has the right to pass. It can be a footpath (used for walking), a bridleway (used for walking, riding a hours and cycling) or a byway that is open to all traffic (including motor vehicles).
Regional Character Area	RCA	Referred to within the regional character assessment by English Heritage and Lincolnshire County Council
Roll on-roll off	Ro-ro	A design to allow vehicles to drive on and drive off ships.
Royal Society for the Protection of Birds	RSPB	Nature conservation charity for the protection of birds.
Short term	St	Nature of effect lasting 1-5 years.
Site of Special Scientific Interest	SSSI	Area of land notified by Natural England under section 28 of the Wildlife and Countryside Act 1981 as being of special interest due to its flora, fauna or geological or physiological features.
Special Area of Conservation	SAC	Sites designated under EU legislation for the protection of habitats and species considered to be of European interest.
Special Protection Area	SPA	Sites designated under the European Directive on the Conservation of Wild Birds for the protection of birds in member states.
Technical Guidance Note	TGN	Technical Guidance Notes aims to assist professionals with their respective assessments.
Temporary	T	Lasting for only a limited time; not permanent.
Marine Character Area	MCA	A Marine Character Area is a marine geographic area around the Welsh coastline, designated by Natural Resources Wales for the purposes of characterising

Term	Acronym	Meaning
		the key natural, cultural and perceptual influences on the defined area.
Tree Preservation Order	TPO	An order made by a local planning authority, under the Town and Country Planning Act 1990, in respect of trees and woodlands. The principal effect of a tree preservation order is to prohibit the cutting down, uprooting, topping, lopping, wilful damage or wilful destruction of trees without the local planning authority's consent.
Zone of Theoretical Visibility	ZTV	Map produced (usually digitally to specific criteria to illustrate the area(s) from which a project can theoretically be visual.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 14: Historic Environment (Terrestrial)

Associated British Ports

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Table of contents

Chapter Pages

Tables

14 Historic Environment (Terrestrial)

14.1 Introduction

14.1.1 This chapter presents the preliminary findings of the assessment of the likely significant effects of the Project on the historic environment (terrestrial). For more details about the Project, including construction methodology, layout and life span, refer to **Chapter 2: The Project**.

14.1.2 References to 'the Project' within this chapter relate to the landside infrastructure components as detailed in **Section 2.4** of **Chapter 2: The Project**.

14.1.3 There may be interrelationships related to the potential effects on the historic environment (terrestrial) and other disciplines. Therefore, also refer to the following chapters:

a. **Chapter 15: Historic Environment (Marine)**.

b. **Chapter 21: Ground Conditions and Land Quality**.

14.1.4 This chapter is supported by the following figures and appendices:

a. **Figure 14.1:** Designated Heritage Assets (PEI Report, Volume III).

b. **Figure 14.2:** Non-Designated Heritage Assets (PEI Report, Volume III).

c. **Figure 14.3:** Historic Landscape Character (PEI Report, Volume III).

d. **Appendix 14.A:** Heritage Standards and Guidance (PEI Report, Volume IV).

e. **Appendix 14.B:** Desk-Based Assessment (PEI Report, Volume IV).

f. **Appendix 14.C:** Written Scheme of Investigation (PEI Report, Volume IV).

14.1.5 This chapter is based on research and evaluation works undertaken at the time of writing. This primarily includes a Cultural Heritage Desk-Based Assessment (DBA), the findings of which have guided the baseline and impact assessment presented in this chapter. The desk-based assessment has helped to further inform understanding of the significance and setting of heritage assets within the defined study area (refer to **Section 14.2**).

14.2 Approach to Assessment

Scope and Methods

14.2.1 A scoping exercise was undertaken in August 2022 to establish the form and nature of the historic environment (terrestrial) assessment, and the approach and methods to be followed.

14.2.2 The Scoping Report (**Appendix 1.A** of PEI Report Volume IV) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on the historic environment (terrestrial).

14.2.3 Following receipt of the Scoping Opinion (**Appendix 1.B** of PEI Report Volume IV) regarding the information to be provided in the ES, **Table 14.1** displays the

consultation undertaken to date to inform this chapter, as well as where comments have been addressed within the chapter.

Table 14.1 Scoping Opinion comments on historic environment (terrestrial)

Consultee	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	The Scoping Report seeks to scope out this matter on the grounds that project operation and decommissioning would not result in additional impacts to buried archaeological remains to those experienced during construction. The Inspectorate agrees that this matter can be scoped out of the assessment.	Noted. No further comment needed.
	The Scoping Report seeks to limit the scope of the assessment of built heritage to the impacts on the setting of two non-designated rows of terraced housing on Queens Road, as other assets within the study area are sufficiently distant from the site and shielded by other development. In light of the evidence provided in Appendix D -Cultural Heritage Desk Based Assessment, the Inspectorate agrees with the proposed scope of the built heritage assessment.	Noted. No further comment needed.
	The Scoping Report seeks to limit the scope of the assessment of impacts to historic landscape character to the western fringe of the Proposed Development area. In light of the evidence provided in Appendix D -Cultural Heritage Desk Based Assessment, the Inspectorate agrees with the proposed scope of the built heritage assessment.	Noted. No further comment needed.
	The Scoping Report does not refer to decommissioning within its proposals for scoping in/out with respect to impacts on built heritage and historic landscape. Subject to the provision of the Outline Decommissioning Plan secured within the DCO to detail measures to avoid or reduce impacts on built	Noted. No further comment needed.

Consultee	Summary of Response	How comments have been addressed in this chapter
	heritage and historic landscape, the Inspectorate agrees to scope out this matter from the ES.	
	The Scoping Report proposes a staged programme of archaeological evaluation, stating only that geophysical survey or evaluation trenching may be required. However, Appendix D paragraph 4.58 states that archaeological potential of the site is high for some features, and paragraph 6.6 recommends that archaeological evaluation is undertaken including geoarchaeological investigation and targeted trial trenching. The extent of survey activity should be agreed as part of a Written Scheme of Investigation with NELC, where possible. Where necessary intrusive investigations should be completed prior to submission of the DCO application.	A Written Scheme of Investigation (WSI) has been produced that sets out a scope of archaeological investigation to be completed prior to the submission of the DCO application. That scope of works includes Ground Investigation (GI) Watching brief, geoarchaeological borehole survey, trial trench evaluation and geophysical survey. This scope of works has been agreed with the County Archaeologist (**Appendix 14.C** PEI Report, Volume VIV).
	The Proposed Development has potential to alter drainage patterns and this could indirectly affect below ground heritage assets. The ES should provide commentary on the likelihood of indirect impacts on heritage assets to arise and outline any necessary mitigation measures to address significant effects where they are likely to occur	A greater understanding of the ground make up and any archaeological features present will be provided by the archaeological evaluation to be undertaken prior to submission of the DCO application. This will allow recommendations to be made regarding the possibility of indirect impacts on below ground heritage assets and outline any necessary mitigation measures. This will be undertaken in consultation with the County Archaeologist (**Appendix 14.C** PEI Report, Volume IV).
	The Applicant's attention is drawn to the consultation response from Immingham Town Council regarding the historical value of 31 Queen's Road.	The PEI Report chapter has considered these properties. The value of the assets is assessed as low. The impact of the construction of the Project within the setting of the asset is assessed as of medium magnitude, resulting in a minor adverse effect which is not significant.
Historic England	We are in general agreement regarding the content of the Scoping Report (AECOM: August 2022) and the areas of the	Noted. An intertidal walkover survey was undertaken on 25 October 2022 in order to ensure baseline coverage of

Consultee	Summary of Response	How comments have been addressed in this chapter
	Historic Environment which are to be scoped in and out of the assessment. It is important to make sure that the area of the terrestrial and maritime heritage assessments abut or overlap so that no assets are missed and the setting of assets can be assessed as a whole.	the intertidal zone has been considered for terrestrial and marine heritage aspects.
	This development could, potentially, have an impact upon a number of designated and un-designated terrestrial and maritime heritage assets and their settings in the area around the site. In line with the advice in the National Planning Policy Framework (NPPF), we would expect the Environmental Statement to contain a thorough assessment of the likely effects which the proposed development might have upon those elements which contribute to the significance of these assets. Given the heights of the structures associated with the proposed development and the surrounding landscape character, this development is likely to be visible across a very large area and could, as a result, affect the significance of heritage assets at some distance from this site itself. We would expect the assessment to clearly demonstrate that the extent of the proposed study area is of the appropriate size to ensure that all heritage assets likely to be affected by this development have been included and can be properly assessed.	Noted. Will be incorporated in the ES as appropriate for designated and un-designated marine heritage assets.
	It is important that the assessment is designed to ensure that all impacts are fully understood including associated activities (such as construction, servicing and maintenance, and associated traffic) might have upon perceptions, understanding and appreciation of the heritage assets in the area. Section drawings and techniques such as photomontages are a useful part of this. The likelihood of alterations to drainage patterns should also be considered as	Noted. Will be incorporated in the ES as appropriate for designated and un-designated marine heritage assets.

Consultee	Summary of Response	How comments have been addressed in this chapter
	this may lead to in situ decomposition or destruction of below ground archaeological remains and deposits, and the subsidence of buildings and monuments. We would strongly recommend that you involve the Historic Environment Officers at North and North East Lincolnshire Councils in the development of this assessment. They are best placed to advise on: local historic environment issues and priorities; how the proposal can be tailored to avoid and minimise potential adverse impacts on the historic environment; the nature and design of any required mitigation measures; and opportunities for securing wider benefits for the future conservation and management of heritage assets.	
Immingham Town Council	One of the properties, 31 Queens Road, appeared to have some historical value to the area, as it is unique and was build for the Pastor of Seaman's Mission. This should be protected.	The PEI Report chapter has considered these properties. The value of the assets is assessed as low. The impact of the construction of the Project within the setting of the asset is assessed as of medium magnitude, resulting in a minor adverse effect which is not significant.
North East Lincolnshire Council	NELC is happy with the details set out in the scoping document.	Noted.

Legislation, Policy and Guidance

14.2.4 **Table 14.2** presents the legislation, policy and guidance relevant to the historic environment (terrestrial) assessment and details how their requirements will be met by the Project.

Table 14.2 Relevant legislation, policy and guidance regarding historic environment (terrestrial)

Legislation/ Policy/ Guidance	Consideration within the PEI Report
Ancient Monuments and Archaeological Areas Act 1979 (as amended) (Ref 14-3)	
Imposes a requirement for Scheduled Monument Consent for any works of demolition, repair and alteration that might affect a Scheduled Monument.	There are no Scheduled Monuments in the study area and, whilst this is the case, monuments just outside of the study area have also been considered.
Planning (Listed Buildings and Conservation Areas) Act 1990 (Ref 14-16)	
Sets out the principal statutory provisions that must be considered in the determination of any application affecting listed buildings and conservation areas. Section 66 and 72 are specifically applicable (see the Cultural Heritage DBA for further details).	Listed buildings and conservation areas in the study area have been identified. **Section 14.3** indicates that there are three Grade II listed buildings located within the 2km study area. There are no conservation areas in the study area.
National Policy Statement for Ports (NPSfP) (Ref 14-14)	
Section 5.12 of the NPSP recognizes that the construction, operation and decommissioning of port infrastructure has the potential to result in adverse impacts on the historic environment. It sets out the expectations for assessment if a development site includes or has potential to include heritage assets with an archaeological interest.	The requirements of the NPSP are being taken into account by the historic environment assessment for the Project.
National Planning Policy Framework (NPPF) (Ref 14-17)	
The NPPF sets out the Government's planning policies for England and how these should be applied to contribute to the achievement of sustainable development. Section 16 specifically deals with the historic environment. The NPPF sets out a clear framework to ensure that heritage assets are conserved, and where appropriate enhanced, in a manner that is consistent with their significance. Significance is defined in Annex 2 of the NPPF.	The requirements of the NPPF are being taken into account by the historic environment assessment for the Project. As part of the NPPF, a core planning principle is to conserve heritage receptors in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of this and future generations (Ministry of Housing, Communities and Local Government, 2021). Section 16 of the NPPF, entitled 'Conserving and enhancing the historic environment', sets out the principal national guidance on the importance, management and

Legislation/ Policy/ Guidance	Consideration within the PEI Report
	safeguarding of heritage assets within the planning process.
National Planning Practice Guidance (PPG) (Ref 14-18)	
The PPG provides further advice and expands on the guidance and policy outlines in the NPPF. Paragraph 009 states that heritage assets may be affected by direct physical change or by change to their setting. Paragraph 013 recognises the contribution that setting makes to the significance of the heritage asset does not depend on there being public right or the ability to experience that setting. The PPG discusses how to assess if there is substantial harm and the importance of assessing if a proposal causes substantial harm that is the impact of significance of the heritage asset.	The guidance provided in the PPG are being taken into account by the historic environment assessment for the Project.
Infrastructure Planning (Decisions) Regulations 2010 (Ref 14-12)	
Section 3 refers to Listed buildings, conservation areas and scheduled monuments. 3(1) When deciding an application which affects a listed building, or its setting, the decision-maker must have regard to the desirability of preserving the listed building or its setting or any features of special architectural or historic interest which it possesses. 3(2) When deciding an application relating to a conservation area, the decision-maker must have regard to the desirability of preserving or enhancing the character or appearance of that area. 3(3) When deciding an application for development consent which affects or is likely to affect a scheduled monument or its setting, the decision-maker must have regard to the desirability of preserving the scheduled monument or its setting.	The assessment provided in this PEI Report has provided evidence to support consultees consideration of Listed buildings, conservation areas and scheduled monuments.
East Inshore and East Offshore Marine Plans (Ref 14-6)	
The East Inshore and East Offshore Marine Plans provide guidance for sustainable development for the coastal area between Flamborough Head to Felixstowe. It provides a clear approach to managing the East Inshore and Offshore areas, its resources and activities and interactions that occur in this area. Plan policy SOC2 is specific to	The requirements of the East Inshore and East Offshore Marine Plans are being taken into account by the historic environment assessment for the Project.

Legislation/ Policy/ Guidance	Consideration within the PEI Report
heritage assets and applies to both the Inshore and Offshore Marine Plans.	
North East Lincolnshire Local Plan 2013 to 2032 (2018) (Ref 14-15)	
Policy 39 Conserving and enhancing the historic environment sets out a clear approach providing guidance to developers on how to safeguard and respond to the historic environment, recognizing designated and non-designated heritage assets. The Plan's Strategic Objectives provide a framework for the Plan policies to facilitate the form and pattern of development to ensure that the vision is fully realized by 2023. SO6 refers to the built, historic and natural environment, to ensure that the development needs are met in a way that safeguards and enhances the quality of the built, historic and natural environment.	The requirements of the North East Lincolnshire Local Plan policies are being taken into account by the historic environment assessment for the Project.
Historic England Guidance	
The most relevant Historic England guidance for this report are the following: GPA2 emphasises the importance of having a knowledge and understanding of the significance of heritage assets likely to be affected by development (Ref 14-20). GPA3 provides guidance on the setting of heritage assets (Ref 14-8). Historic England Advice Note 12 outlines a recommended approach to assessing the significance of heritage assets in line with requirements of the NPPF (Ref 14-10). Historic England Advice Note 15 covers commercial and renewable energy development and the historic environment (Ref 14-19).	The historic environment assessment methodology takes into account Historic England guidance.
Principles of Cultural Heritage Impact Assessment in the UK (Ref 14-11)	
Provides guidance on understanding cultural heritage assets and evaluating the consequences of change.	The historic environment assessment methodology takes into account IEMA guidance.
Chartered Institute for Archaeologists (CIfA) Code of Conduct and Standards and Guidance for Historic Environment Desk-Based Assessment. (Ref 14-4)	
Provides a code of conduct and standards and guidance for historic environment desk-based assessment for archaeologists in order to	These codes, standards and guidance have been taken into account by the historic environment assessment.

Legislation/ Policy/ Guidance	Consideration within the PEI Report
appropriately investigate the historic environment and the impacts of proposed developments.	
Lincolnshire County Council Archaeology Handbook (2019) (Ref 14-13)	
Archaeology handbook that sets out guidelines for planners, developers, consultants and archaeological contractors. It contains principles of modern historic environment resource management that historic environment professional practitioners need to consider when working in Lincolnshire.	The historic environment assessment methodology takes into account the Lincolnshire County Council Archaeology Handbook guidance. The requirements of these policies have been considered when undertaking the assessment at this stage of the project.

Study Area

14.2.5 The study area for the historic environment (terrestrial) assessment was defined to include heritage assets that have the potential to be at risk from possible direct and indirect impacts that might arise from the construction, operation and decommissioning of the landside infrastructure elements of the Project within the West Site, the Pipeline Corridor, the East Site and the temporary construction area on Laporte Road.

14.2.6 The red line boundary of the site has changed from that shown in the Desk Based Assessment (**Appendix 14.B** (PEI Report, Volume IV)), and again from that shown in the Written Scheme of Investigation (**Appendix 14.C** (PEI Report, Volume IV)). The boundary shown in the WSI has the addition of the temporary construction area at the east end of the site on Laporte Road. The current redline boundary shown in the figures of this PEI Report has been widened slightly, particularly along its southern boundary. These changes are recognised in this assessment and the study areas as set out in **Paragraph 14.2.8** remain relevant and applicable. This doesn't add any further assets that will be affected by the scheme. The study areas will be reassessed during the production of the Environmental Statement (ES) and any additional affected assets will be addressed in that process.

14.2.7 A study area of 1.6km from the approximate centre of the Site was defined to capture all cultural heritage assets with the potential to be affected by the Project (refer to **Figure 14.1** for designated heritage assets and **Figure 14.2** for non-designated heritage assets (PEI Report, Volume III)). For designated heritage assets, the study area was extended to 2km to capture heritage assets whose significance may be impacted by the Project through changes to their setting.

Sources of Information

14.2.8 Several data sources have been consulted during the preparation of this chapter to define the preliminary conditions for heritage assets. Sources of information consulted include:

a. National Heritage List for England (NHLE).

b. North East Lincolnshire Historic Environment Record (HER) and Historic Landscape Characterisation (HLC).

c. Various online resources including the British Geological Survey (BGS), geology of Britain Viewer, and the local planning portal for the Local Plan and any other planning information.

d. Published and unpublished literature (including a detailed review of reports for previous fieldwork carried out within the Site boundary and its proximity).

e. Results of aerial photography assessment.

f. Documentary, cartographic and other resources as deposited within the Local Archives and Local Studies Library.

14.2.9 The heritage assets discussed within the preliminary assessment, including designated and non-designated heritage assets, are identified by their unique identification number assigned by the NHLE for designated assets and by the HER for non-designated heritage assets. The HER numbers are prefixed MNL for North East Lincolnshire. All assets are identified within the text using their unique identifier and can be cross-referenced to the gazetteers (**Appendix 14.B** of PEI Report Volume IV) and **Figures 14.1** and **14.2** (PEI Report Volume III).

14.2.10 A site inspection visit was undertaken on 18 May 2022 to record the survival, extent, condition, setting and significance of cultural heritage assets within the defined study area. The setting of heritage assets was also identified and potential Project impacts considered. Such works were undertaken as part of the Historic Environment DBA.

14.2.11 The Historic Environment DBA (Ref 14-1) was undertaken to understand the potential impact of the Project on the significance (including the setting) of the heritage assets potentially affected by the Project. The Historic Environment DBA considers the landside terrestrial elements of the Project and the information collated has been used to inform this preliminary assessment.

14.2.12 A geophysical survey was undertaken in 2013 (Ref 14-7) within the west part of the Site which identified various anomalies which are likely to be related to buried palaeoenvironmental features. Some features identified could relate to possible medieval salt production sites on the edge of, or close to, former tidal channels.

14.2.13 Further evaluative work is to be undertaken across the Site. This includes an archaeological watching brief of geotechnical investigations, a geoarchaeological borehole survey, a geophysical survey and an archaeological trial trenching evaluation. The Written Scheme of Investigation (WSI) (Ref 14-2) sets out the scope of these works and has been agreed with the Heritage Officer for North East Lincolnshire. Such works have not been undertaken at the time of writing but are planned for early in 2023. The results of the surveys will provide further details on the heritage interest and significance of any heritage assets identified and will be included in the ES.

Stakeholder Engagement

14.2.14 A range of stakeholders have been engaged as part of the scoping process to obtain their views on the Project and the scope of the historic environment

(terrestrial) assessment, the results of which are presented within the Scoping Opinion (**Appendix 1.B** of PEI Report Volume IV).

14.2.15 The Heritage Officer for North East Lincolnshire has been consulted throughout the production of the WSI via email. This followed an initial meeting held 18th August 2022, via Microsoft Teams, attended by the Archaeological Consultant, client representatives and the Heritage Officer for North East Lincolnshire in which the Project was outlined and the planned archaeological approach (now encompassed in the WSI) was discussed and agreed.

Limitations and Assumptions

14.2.16 The information presented in this preliminary assessment reflects that obtained and evaluated at the time of reporting and is based on an emerging design for the Project and the maximum likely extents of land required for its construction and operation based on the application of the Rochdale Envelope.

14.2.17 The WSI for geophysical survey, watching brief of ground investigation works, geoarchaeological survey and trial trenching has been approved by the Heritage Officer for North East Lincolnshire. Such works will be undertaken, with the results being used to further define the heritage interest and significance of any heritage assets identified on the Site and reported in the ES.

14.2.18 The preliminary assessment will be further developed and refined following statutory consultation and as additional information becomes available, including the results of the geoarchaeological boreholes, geophysical survey, trial trenching and ground investigation watching brief, with a final assessment present within the ES. It is currently assumed that access to all required land will be available to undertake both intrusive and non-intrusive archaeological surveys. In the event that access is not available, professional judgement will be used, based on the available research and data, to assess the archaeological potential of the area.

14.2.19 This preliminary assessment is based on the extent of the research and evaluation works undertaken at the time of writing. The Cultural Heritage DBA provides the basis of this chapter.

14.2.20 A wide range of data sources (see **Paragraph 14.2.8**) have been used to define baseline historic environment conditions in the study area. It is assumed that any data provided by third parties is accurate.

14.2.21 It has been assumed that 100% of the area within the Site would be physically affected by the proposed works and the impact on applicable heritage assets considered herein have been assessed accordingly.

14.2.22 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further through the assessment and consultation processes, and as further research and investigative surveys are completed to fully understand its potential effects.

Impact Assessment Methodology

14.2.23 This section sets out the approach to the assessment of the potential impacts and effects of the Project on designated and non-designated heritage assets. It is in line with the wider methodology set out in **Chapter 5: EIA Process** of this PEI Report. The objective of this preliminary assessment is to identify the potential for significant effects as associated with the Project (which can be beneficial or adverse). The significance of potential effects has been determined by considering the value of the cultural heritage resource with the predicted magnitude of impact upon it due to the Project.

14.2.24 The cultural heritage assessment includes an assessment of the heritage significance of potentially affected assets, in line with NPSfP . This requires the provision of information sufficient to enable adequate understanding of the potential impacts on the significance of any heritage asset. This is consistent with the requirements of NPSfP and in line with the NPPF. Both documents also require this assessment to take account of changes to both the physical asset and its setting.

14.2.25 The NPSfP and the NPPF set out criteria which should be considered when assessing the significance of cultural heritage assets, which include archaeological, architectural, artistic and historic interest. These criteria have been used in the assessment of significance for each potentially affected asset and this information, in conjunction with professional judgement, has been used to assess the value of heritage assets.

14.2.26 Both documents relate to impacts affecting the value of heritage assets with negative impacts being equated to ‘harm’. There is a requirement for the decision maker to determine whether the level of harm amounts to ‘substantial harm’ or ‘less than substantial harm’. NPSfP and NPPF make it clear that substantial harm to, or loss of, a Grade II designated asset should be exceptional and that to a Grade II* or I asset, or Scheduled Monument, should be ‘wholly exceptional’. There is no direct correlation between the significance of effects identified through the EIA process and the level of harm caused to heritage significance.

Significance criteria

14.2.27 The value of a heritage asset (its heritage significance) is guided by its designated status but is derived also from its heritage interest which may be archaeological, architectural, artistic or historic (NPPF Annex 2, Glossary). Each identified heritage asset can be assigned a value in accordance with the criteria set out in **Table 14.3** – these criteria have been developed using available guidance, experience on comparable development schemes and professional judgement. Using professional judgement and the results of consultation, heritage assets are also assessed on an individual basis taking into account and regional variations and individual qualities where applicable.

Table 14.3 Criteria for assessing the value of heritage assets

Asset Value	Description
High	World Heritage Sites Scheduled Monuments Grade I and II* listed buildings Registered battlefields Grade I and II* registered parks and gardens Conservation areas of demonstrable high value Non-designated heritage assets (archaeological sites, historic buildings, monuments, parks, gardens, or landscapes) that can be shown to have demonstrable national or international importance. Well preserved historic landscape character areas, exhibiting considerable coherence, time-depth, or other critical factor(s).
Medium	Grade II listed buildings Conservation areas Grade II registered parks and gardens Conservation areas Non-designated heritage assets (archaeological sites, historic buildings, monuments, parks, gardens, or landscapes) that can be shown to have demonstrable regional importance. Averagely preserved historic landscape character areas, exhibiting reasonable coherence, time-depth, or other critical factor(s). Historic townscapes with historic integrity in that the assets that constitute their make-up clearly legible.
Low	Locally listed buildings Non-designated heritage assets (archaeological sites, historic buildings, monuments, parks, gardens, or landscapes) that can be shown to have demonstrable local importance. Assets whose values are compromised by poor preservation or survival of contextual associations to justify inclusion into a higher grade. Historic landscape character areas whose value is limited by poor preservation and/ or poor survival of contextual associations.
Very Low (Not Significant)	Assets identified on national or regional databases, but which have no archaeological, architectural, artistic or historic value. Assets whose values are compromised by poor preservation or survival of contextual associations to justify inclusion into a higher grade. Landscapes with no or little significant historical merit.

14.2.28 Having identified the value of the heritage asset, the next stage in the assessment is to identify the level and degree of impact to an asset arising from

the applicable development. The impacts of a development upon heritage assets can be positive or negative; direct or indirect; long term or temporary; and/ or cumulative. Impacts may arise during construction, operation and decommissioning. Impacts can occur to the physical fabric of the asset or affect its setting. Direct physical impacts are considered permanent and could result in the total, or partial, loss of a heritage asset. These impacts are not reversible. Impacts as a result of changes to setting are split between those resulting from construction activities which are short-term, and those considered to last for the duration of the development operation. These operational impacts are considered to be long-term, but can be reversed upon development decommissioning.

14.2.29 The level and degree of impact (impact rating) has been assigned with reference to a four-point scale as set out in **Table 14.4** which have been developed using available guidance, past experience on comparable development schemes and professional judgement. The assessment of the level and degree of impact has been made taking into account any defined mitigation measures, including those embedded in the scheme design. If no impact is identified, no impact rating has been given, and no resulting effect reported.

Table 14.4: Factors influencing the assessment of magnitude of impacts

Magnitude of Impact	Description of Impact
High	Changes such that the significance of the asset is totally altered or destroyed. Comprehensive change to (positive or negative), or total loss of, elements of setting that would result in change to the asset and our ability to understand and appreciate its significance.
Medium	Change such that the setting of the asset is noticeably different, affecting significance and resulting in changes in our ability to understand and appreciate the significance of the asset.
Low	Changes to the setting that have a slight impact on significance resulting in changes in our ability to understand and appreciate the significance of the asset.
Very Low	Changes to the asset that hardly affect significance. Changes to the setting of an asset that have little effect on significance and no real change in our ability to understand and appreciate the significance of the asset.

14.2.30 Effects have been classified (taken into consideration any mitigation) using the matrix at **Table 14.5**, which takes account of the value of the heritage asset (**Table 14.3**) and the predicted magnitude of impact due to the Project (**Table 14.4).** Effects can be neutral, adverse or beneficial.

Table 14.5 Classification of effects

Importance of Receptor	Magnitude of Impact			
	Very Low	Low	Medium	High No Change
High	Minor (not significant)	Moderate (potentially significant)	Major (significant)	Major (significant)
Medium	Minor (not significant)	Minor (not significant)	Moderate (potentially significant)	Major (significant)
Low	Negligible (not significant)	Minor (not significant)	Minor (not significant)	Moderate (potentially significant)
Very Low	Negligible (not significant)	Negligible (not significant)	Minor (not significant)	Minor (not significant)

14.2.31 The baseline assessment has been undertaken in accordance with guidance set out by the Chartered Institute for Archaeologists (CIfA) and Historic England, in particular the Standard and Guidance for Historic Environment Desk-Based Assessment (Historic England) and the Code of Conduct (CIfA).

14.2.32 Principles of Cultural Heritage Impact Assessment in the UK (Ref 14-11) is a guide to good practice in cultural heritage impact assessment published jointly by the Institute of Environmental Management and Assessment (IEMA), the Institute of Historic Building Conservation (IHBC) and the Chartered Institute for Archaeologists (CIfA). The document provides guidance on understanding cultural heritage assets and evaluating the consequences of change and will be considered when undertaking the assessment.

14.3 Baseline Conditions

Current Baseline

14.3.1 This section describes the baseline environmental characteristics for the Project and defined study area with specific reference to cultural heritage.

14.3.2 There are no World Heritage Sites, Scheduled Monuments, Grade I and II* listed buildings, conservation areas, registered parks and gardens, registered battlefields within the 2km study area for designated heritage assets. There are a total of three Grade II listed buildings of medium value located within the 2km study area, comprising of the Immingham War Memorial (NHLE 1455139), Churchfield Manor (NHLE 1161630) and the Iron Bungalow (NHLE 1391349).

14.3.3 Immingham War Memorial (NHLE 1455139) is located at the junction of Humberville Road and Pelham Road, approximately 1.57km to the north-west of the Site. The asset is considered to have medium heritage value, derived from its architectural merit and historic interest associated with the World Wars. This designated asset would not be affected by the Project as it is located at a sufficient distance, its setting comprising of the urban area of Immingham town centre. The Project would not have an impact on the asset's setting or affect its significance or heritage interest and is therefore not considered further in this assessment.

14.3.4 Churchfield Manor (NHLE 1161630) is located on Church Lane, bordered to the north by agricultural fields and to the east by Immingham Golf Course, approximately 2km north-west of the Site. The asset is considered to have medium heritage value stemming from architectural merit and historic interest as a 17th century vernacular farmhouse. This asset would not be affected by the Project as it is located at a sufficient distance, its setting comprising of the semi-rural area north of Immingham. The Project would not have an impact on the asset's setting or affect its significance or heritage interest and is therefore not considered further in this assessment.

14.3.5 The Iron Bungalow (NHLE 1391349) is located on Pelham Road, approximately 1.8km west of the Site. The asset is considered to have medium heritage value, stemming from its architectural and historic interest, utilising an unusual construction form and having an association with the construction of Immingham Docks. This asset would not be affected by the Project as it is located at a sufficient distance, its setting comprising of the urban area of Immingham town centre. The Project would not have an impact on the asset's setting or affect its significance or heritage interest and is therefore not considered further in this assessment.

14.3.6 The Church of St Andrew (NHLE 1310011) Grade I is located just outside of the study area, approximately 2.2km north-west of the Site boundary. In addition, the Church of St Peter and St Paul (NHLE 1346978), Grade II* listed, and two Scheduled Monuments, comprising of Stallingborough medieval settlement (NHLE 1020423) and a cross in the churchyard of St Peter and St Paul's Church (NHLE 1020023 and NHLE 1161697), have been identified approximately 2.4km south-west of the Site. As these heritage assets are all considered to be of high value and therefore sensitive to change within their setting, they have been included in this preliminary assessment.

14.3.7 The Church of St Andrew (NHLE 1310011) is considered to have high heritage value, derived from architectural, historic and archaeological interest as a medieval parish church. The immediate setting of the church comprises the churchyard which is enclosed by mature trees and foliage. The asset will not be affected by the Project as it is located at a sufficient distance, shielded from views by foliage and the Project is not considered to fall within the asset's wider setting, which includes the historic parish. The Project would not have an impact on the asset's setting or affect its significance or heritage interest and is therefore not considered further in this assessment.

14.3.8 The Church of St Peter and St Paul (NHLE 1346978), and the scheduled churchyard cross (NHLE 1020023), are located east of the village of Stallingborough. The assets are considered to have high heritage value, derived from architectural, historic and archaeological interest as a post-medieval church and churchyard cross, with some reuse of medieval masonry. The setting of both assets comprises of the churchyard and wider parish. The asset will not be affected by the Project as it is located at a sufficient distance, shielded from views by trees and mature foliage which enclose the churchyard, the topography of the landscape and intervening development, including the railway and A180 roadway. The Project is not considered to fall within the assets' wider setting, which includes the historic parish. The Project would not have an impact on the assets' setting or affect their significance or heritage interest and is therefore not considered further in this assessment.

14.3.9 Stallingborough scheduled medieval settlement (NHLE 1020423) is located east of the village of Stallingborough. The asset is considered to have high heritage value, derived from archaeological and historic interest associated with a deserted section of the village and earthworks of a post-medieval manor and formal gardens. The setting of the asset comprises of the parish of Stallingborough and the surrounding rural landscape. The asset would not be affected by the Project as it is located at a sufficient distance, shielded from views by hedgerows, the topography of the landscape and intervening development, including the railway and A180 roadway. The Project is not considered to fall within the asset's setting. The Project would not have an impact on the asset's setting or affect its significance or heritage interest and is therefore not considered further in this assessment.

14.3.10 There are two rows of non-designated terraced housing on the Queens Road (ACM1) of limited historic and architectural interest that have the potential to be impacted by the Project through changes to their setting.

14.3.11 North East Lincolnshire Council (NELC) maintains local lists of historic assets of special interest. The local list for 'Immingham and the Villages' includes two assets, a high-status Roman settlement and industrial site (MNL4490) (refer to section below on Roman assets) and the Immingham Police Station (MNL4726) located approximately 1.57km north-west of the centre of the Site. The Police Station, cells and houses were built in 1912 and are now currently used as private offices. The Police House is considered to have low heritage value associated with its historic and architectural interest as an early 20th century civic building. The Project would not have an impact on the asset's setting or affect its significance or heritage interest and is therefore not considered further in this assessment.

Prehistoric (up to AD 43)

14.3.12 There is one asset of prehistoric date recorded within the 1.6km study area. The earliest evidence is a pair of prehistoric ditches (MNL4182), identified approximately 1.1km south-east of the Site centre. These ditches may have been dug to flank a trackway. They contained flintwork of Neolithic (4,000BC-2,500BC) or Bronze Age (2,500BC-700BC) date. The flintwork suggests prehistoric occupation in the area.

Roman (AD 43 to AD 410)

14.3.13 Archaeological investigation within the 1.6km study area has found evidence for a high-status Roman settlement and industrial site (MNL4490), located approximately 1.4km south-west of the Site at Mauxhall Farm at Stallingborough Interchange. An undated possible oval enclosure (MNL4618) to the west of the West Site could be related to the Roman settlement.

14.3.14 Undated cropmarks of rectangular ditched enclosures (MNL4607), located approximately 1.1km to the south-east of Site centre, could form part of the Roman landscape.

Early Medieval (AD 410-1066)

14.3.15 There are no assets of early medieval date (AD 410-1066) within the study area.

Medieval (1066-1540)

14.3.16 There is evidence for medieval (AD 1066-1540) settlement activity within the study area. A possible deserted medieval settlement (MNL326) near Mauxhall Farm is visible on aerial photography, including ridge and furrow cultivation features, trackways, and possible building platforms. Ridge and furrow (MNL2235) are also recorded at Stallingborough.

Post Medieval (1540-1900)

14.3.17 Aerial photography has recorded the remains of post-medieval field boundaries and narrow ridge and furrow cultivation features at Harborough Marsh (MNL4648, MNL4653, MNL4658, MNL4659, MNL4660), as well as the presence of either singular or a series of drainage ditches. These include North Moss Lane, Kiln Lane and Laporte Road, amongst others (MNL1793, MNL4603, MNL4604, MNL4606, MNL4620).

14.3.18 Within the study area, a series of historic roads and trackways (MNL3507, MNL3508, MNL3509, MNL3510, MNL3512, MNL3522, MNL3523, MNL3524) of post-medieval date are recorded on the early Ordnance Survey (OS) maps which may have origins in the medieval period.

14.3.19 Several woodland features are located within the study area - these are shown on historic OS maps and are all of low value, including Long Strip (MNL1797) and Fox Covert (MNL1799). Other landscape features recorded include an osier at Reeds Meer (MNL2684), a mere at Stallingborough (MNL2685), and a spring also at Stallingborough (MNL4299).

Modern (1901-present)

14.3.20 Aerial photographs and historic OS maps record historic flood defences across the study area, including at Immingham, Kiln Lane Trading Estate, and at Harborough Marsh (MNL4682, MNL2086, MNL4608, MNL4650). Historic OS maps also record the presence of several features associated with coastal navigation and transportation, including Stallingborough Ferry (MNL3131) and the site of a coastguard station (MNL1790).

14.3.21 Immingham Dock was established by the Humber Commercial Railway and Dock Company in association with the Great Central Railway (MNL272). A temporary settlement of workers' village was established at Immingham comprising a series of corrugated tin huts, known as Tin Town, for the dock construction workers (MNL1077).

14.3.22 Features that are associated with the historic development and operation of the docks include a coaling stage (MNL3097) and a former grain store (MNL4429). In addition, there are several records relating to the use and expansion of the transportation infrastructure associated with the dock and port at Immingham (MNL2087, MNL2819, MNL3039, MNL3040, MNL3078, MNL4656, MNL4715). During World War I the dock was a submarine base for British D-class submarines. This was later used for cruise ships in the 1930s.

14.3.23 There are numerous features relating to World War II activity recorded within the study area, including gun emplacements, anti-landing obstacles, barrage balloon sites and other buildings and installations (MNL1501, MNL1534, MNL4630, MNL4631, MNL4632, MNL4633, MNL4634, MNL4640, MNL4641, MNL4655, MNL4679, MNL4651, MNL4684, MNL4675, MNL4644, MNL4689, MNL4630, MNL4640, MNL4675). Evidence of German bombing raids is also represented by several lines of small circular hollows on aerial photographs (MNL4623, MNL4643, MNL4645).

14.3.24 In the second half of the 20th century the docks expanded with the construction of east and west jetties and the addition of several deep-water jetties for bulk cargo. Immingham Oil Terminal jetty was constructed in 1969 on the banks of the Humber, East of the dock entrance, whilst Immingham Bulk Terminal was commissioned in 1970 for the export of coal and the import of iron ore. In 1985 the Immingham Gas Jetty was opened.

Unknown

14.3.25 There are several assets of an unknown date located within the 1.6km study area, including several undated cropmark sites recorded on the HER. This includes an area of enclosures or natural features (MNL4106), a sub-circular feature, possible prehistoric ring ditch or another natural feature (MNL4622), and linear features (MNL4400) to the south of Kiln Lane Industrial Site. These features are undated and could belong to any period between the prehistoric to post-medieval and modern period.

14.3.26 Geophysical survey within part of the Site did not identify any significant archaeological features (undertaken in 2013). However, various anomalies were detected which likely relate to buried paleoenvironmental features (former tidal channels and pools), although it is possible that some could relate to possible medieval salt production sites. Recent former land boundaries, land drains, services and ground disturbance were also identified.

14.3.27 The Project is located in the coastal marsh character zone, which is dominated by industrial works, particularly installations related to the petrochemical industry and docks at Immingham. Only the western part of the Site retains any historic character which is related to post-medieval agriculture and 19th century tree belts.

Future Baseline

14.3.28 The future baseline is a prediction of baseline conditions in the future, assuming that the Project is not constructed. In the absence of the Project, parts of the Site will continue to be utilised for port activity. As such, it is considered there will be no change to the future baseline for cultural heritage and that the baseline details as presented above are not anticipated to change in the absence of the Project.

14.4 Development Design and Impact Avoidance

Embedded Mitigation Measures

14.4.1 The Project has been designed, as far as possible, to avoid and minimise environmental impacts and effects through the process of design development, and by embedding mitigation measures into the design. However, due to a lack of heritage assets in the vicinity of the Project, no specific design elements or alterations are required to be implemented to mitigate potential Project impact on any heritage assets.

Evaluation Measures

14.4.2 A comprehensive archaeological evaluation of the Site as defined in the WSI has been developed in consultation with the Heritage Officer for North East Lincolnshire. The evaluation comprises an archaeological watching brief of geotechnical investigations, a geoarchaeological borehole survey, a geophysical survey and archaeological trial trenching. The results of these evaluations will be used to define any further mitigation measures that may be required prior to the construction of the Project. The investigation results will be included in the ES.

Standard Mitigation Measures

14.4.3 Construction of the Project would be subject to measures and procedures defined within a Construction Environmental Management Plan (CEMP), which would be produced prior to the commencement of construction by the construction Contractor and would be based on, and incorporate, the contents and requirements of the outline CEMP which will be submitted with the DCO application.

14.4.4 It is predicted that it would be possible to mitigate the Project's potential impact upon the buried archaeological resource at the Site through a staged programme of archaeological investigation and recording, the purpose of which would be to ensure that identified remains are recorded prior to construction activities commencing.

14.4.5 The first stage would consist of the evaluation measures discussed above which aim to identify the extent and survival of archaeological remains, followed, where required, by excavation of features to ensure that they are fully understood and recorded.

14.4.6 Any further stages of archaeological excavations, such as strip map and record, would be designed using the results of the evaluations and set out in the ES. All archaeological mitigation requirements will be detailed in the outline CEMP.

14.5 Potential Impacts and Effects

14.5.1 The preliminary assessment has identified that construction, operation and decommissioning of the Project landside infrastructure has the potential to result in adverse impacts and effects on the historic environment (terrestrial). The sections below provide details of the potential impacts associated with the Project landside infrastructure during these phases.

Construction

14.5.2 Temporary and short-term construction impacts lasting for all or part of the Project construction phase include the following:

a. The presence and movement of construction plant and equipment, which may impact on the setting of heritage assets.

b. The siting of construction compounds and activities within working areas, including associated construction noise and lighting, which may impact on the setting of heritage assets.

c. The use of traffic management and increased volumes of traffic travelling on the local road network, which may impact on the setting of heritage assets.

14.5.3 Permanent construction impacts lasting beyond the Project construction phase potentially include the following:

a. Physical impacts on known heritage assets rising from construction activities.

b. The disturbance, compaction or removal of previously unrecorded sub-surface archaeological deposits through construction activities.

Operation

14.5.4 Project operation impacts lasting for all or part of the operational phase potentially include the following:

a. Increase in traffic movements on and around the Site (maintenance traffic) which could affect the setting of heritage assets.

b. Impacts on archaeological remains, historic buildings and the historic landscape associated with the introduction of the physical form and appearance of the Project in their setting.

14.5.5 No permanent effects upon the historic environment (terrestrial) as a result of the operational phase of the Project are envisaged (refer to **Section 14.7**).

Decommissioning

14.5.6 Project decommissioning impacts are likely to be similar to those temporary impacts experienced during the Project construction phase. Impacts lasting for all or part of the decommissioning phase of the Project potentially include the following:

a. The presence and movement of plant and equipment, which may impact on the setting of heritage assets.

b. The siting of compound and activities within working areas, including associated noise and lighting, which may impact on the setting of heritage assets.

c. The use of traffic management and increased volumes of traffic travelling on the local road network, which may impact on the setting of heritage assets.

14.5.7 Decommissioning of the Project is unlikely to result in additional temporary or permanent impacts as decommissioning of the landside elements would likely involve leaving underground pipelines in situ. All above ground infrastructure associated with the Project would be dismantled and all material removed.

14.5.8 It is not expected that there would be any permanent impacts during Project decommissioning as a well-designed decommissioning scheme would not have any impact beyond the already-disturbed footprint of the Project; therefore, it is not anticipated that decommissioning activities would have a direct physical impact upon archaeological remains.

14.6 Mitigation and Enhancement Measures

14.6.1 The scope of an archaeological evaluation has been set out in the Written Scheme of Investigation (Ref 14-2). This will be undertaken ahead of the Application and will inform the assessment of the historic environment (terrestrial) in the forthcoming Environmental Statement. This will provide an assessment of the archaeological and geoarchaeological evidence and advise whether any further mitigation measures are required.

14.7 Assessment of Effects for the Historic Environment (Terrestrial)

14.7.1 This section provides a preliminary assessment of likely significant effects on the historic environment associated with the Project. Only those heritage assets which are considered to experience a likely significant effect from the Project, as informed by the desk-based research and professional judgement, are discussed herein. Those assets which would not experience an impact on their significance (as defined above), either physically or through changes to their setting, are omitted. Details of assets within the study area, but not impacted by the Project, are considered in the Cultural Heritage DBA which will be included as a technical appendix to the ES.

14.7.2 No designated heritage assets have been identified as having the potential to experience significant effects as a result of the Project (direct or indirect during any Project stage).

14.7.3 There are eight non-designated heritage assets recorded in the study area that have the potential to be subject to physical impacts or impacts to the significance of assets as caused by changes to their setting as a result of the construction of the Project. Effects upon these non-designated assets are summarised below.

14.7.4 The assessment of potential impacts and effects has assumed that all individual finds recorded on the HER within the study area were removed when found and are therefore no longer present in situ. The location of find spots have been considered when assessing the significance of archaeological sites in their vicinity.

14.7.5 It has been assumed that 100% of the area within the Site would be physically affected by the proposed works and the impact on applicable heritage assets listed below have been assessed accordingly. Any refinement to the Project design may proportionately reduce the currently defined impacts.

14.7.6 **Long Strip (MNL1797)** is a post-medieval plantation marked on the OS 1887 – 1889 25 inch to 1 mile maps. Its heritage value is derived from its archaeological and historic interest as part of the landscape prior to the heavy industrialisation of the area with the construction of the port in the early 20th century. The Pipeline between the East Site and the Jetty, as well as the Jetty Access Road will partially truncate the northern side of the plantation. The value of this asset is assessed as low. It is assessed that there would be a high magnitude of impact as a result of the permanent removal of part of the historic feature through the construction of the Pipeline and the Jetty Access Road, resulting in a **moderate adverse effect** which is **significant**.

14.7.7 The site of a **post-medieval/ modern beacon in Stallingborough (MNL 4263, MNL 4426)** is recorded on the 1887 – 1889 OS map on the edge of the sea defence bank. It is unclear from the records whether this is the site of two separate beacons or the same beacon. Regardless, its heritage value is derived from its archaeological and historical contribution to the maritime heritage of the area. The value of this asset is assessed as low. It is assessed that there would be a high magnitude of impact as a result of the permanent removal of the asset(s) from the construction of the temporary construction area for the Project, resulting in a **moderate adverse effect** which is **potentially significant**.

14.7.8 The site of **World War II anti-landing obstacles (MNL 4640)** is visible as earthworks on aerial photographs taken in 1940 in fields to the east of Immingham. They consist of multiple lines of obstacles on a north-east to south-west orientation. The heritage value of this asset is derived from its archaeological and historical contribution to understanding the defence of the region and the nation during World War II, particularly in relation to the port which would have been considered a key aspect to be defended. The value of this asset is assessed as low. It is assessed that there would be a high magnitude of impact as a result of the permanent removal of the asset from the construction of the facilities at the West Site, resulting in a **moderate adverse effect** which is **potentially significant**.

14.7.9 The **probable site of a World War II bomb crater (MNL 4643)** is visible as earthworks on aerial photographs taken in 1941. The circular hollow is approximately 8m in diameter and lies in the field to the east of Long Strip plantation. This is the site of the temporary construction area for the Project on Laporte Road. The heritage value of this asset is derived from its archaeological and historical contribution to the understanding of the impact of World War II on the landscape around the port of Immingham. The value of this asset is assessed as very low. It is assessed that there would be a high magnitude of impact as a result of the permanent removal of the asset(s) from the construction of the temporary construction area for the Project, resulting in a **minor adverse effect** which is **not significant**.

14.7.10 The **possible site of a World War II barrage balloon mooring (MNL 4651)** is visible as a military installation on aerial photographs taken in the 1940s. It includes a roadway leading to a circular structure with a second circular earthwork to the north-west. The heritage value of this asset is derived from its archaeological and historical contribution to understanding the defence of the region and the nation during World War II, particularly in relation to the port which would have been considered a key aspect to be defended. The value of this asset is assessed as low. If the asset it still present within the landscape, then it is assessed that there would be a high magnitude of impact as a result of the permanent removal of the asset from the construction of the facilities at the East Site, resulting in a **moderate adverse effect** which is **potentially significant**.

14.7.11 A **small rectilinear enclosure (MNL 4652)** is visible as earthworks on aerial photographs taken in 1941 in a field to the west of Queens Road. It is of uncertain function, but has been dated to the 20th century. The heritage value of this asset lies in its archaeological and historical contribution to the understanding of the landscape use and changes around the port in the 20th century, particularly in relation to the impacts of World War II. It is possible that this feature has been removed by modern development and the construction of hardstanding. Should it survive, the value of this asset is assessed as low. It is assessed that there would be a high magnitude of impact as a result of the permanent removal of the asset from the construction of the facilities at the East Site, resulting in a **moderate adverse effect** which is **potentially significant**.

14.7.12 The site of a **Tram Shelter on Queens Road (MNL 4715)** is recorded. It is the site of a single storey building with a rectangular footprint that probably dates to the formation of the Grimsby and Immingham Electric Railway. This spur of the railway dates to approximately 1914. It was probably rebuilt during World War II with engineering brick and considerable use of pre-cast concrete to provide shelter for the workers during air raids. The tram service closed in 1961. The heritage value of this asset lies in its archaeological and historical contribution to understanding the use of this landscape throughout World War II and the immediate post-war period in the 1950s until the closure of the service in the early 1960s. This feature has been removed by modern development and modern road works associated with the upgrading of Queens Road however some associated below ground evidence may remain. Should such archaeological evidence survive, the value of this asset is assessed as very low. It is assessed that there would be a high magnitude of impact as a result of the permanent removal of the asset through the construction of the Pipeline for the Project, resulting in a **minor adverse effect** which is **not significant**.

14.7.13 **Two rows of terraced housing (ACM1) located on the Queens Road** have been identified as a non-designated heritage asset. The terraces date to the early 20th century, likely built as accommodation for dockworkers and their families contemporary to the construction of Immingham Dock. The heritage value of the asset lies in its historic interest, related to the industrial development of the docks and in the limited architectural interest of the terraces. The value of this asset is assessed as low. The impact of the construction of the Project within the setting of the asset is assessed as of medium magnitude, resulting in a **minor adverse**

effect which is **not significant**. This assumes that these properties are not physically impacted by the Project, this will be reassessed at the ES stage.

14.7.14 If further archaeological remains are identified as a result of the evaluations set out in the WSI, the potential for any residual effects will need to be reassessed and reported in the ES. In addition, all potentially significant effects as detailed above will be reassessed once the results of the evaluation works have been collated. The outcomes of the assessment of likely significant effects of the Project on the historic environment (terrestrial) will be reported within the ES.

14.8 Summary of Preliminary Assessment

14.8.1 **Table 14.6** provides a summary of the preliminary assessment of Project effects on the historic environment (terrestrial). This indicates six potentially significant effects upon non-designated heritage assets that would be impacted by Project construction activities on the Site. However, until the results of the archaeological evaluations set out in the WSI are available, it is not possible to definitely state the significance of the impact of the Project on any thus far unidentified archaeological remains. It is also not possible to confirm the significance of effects on the eight assets identified in **Table 14.6** until they can be understood in the context of any further archaeological remains brought to light by the evaluation scope. The significance of effects on the historic environment (terrestrial) will therefore be revisited and reported in the ES, taking account of the evaluation results.

Table 14.6 Summary of Preliminary Assessment – Likely Significant Effects

Receptor Name	Receptor Location	Receptor Value	Mitigation Measures	Magnitude of Impact	Effect
Long Strip (MNL 1797)	Within Pipeline Corridor and Jetty Access Road	Low	Potential to re-route the pipeline away from traversing the Long Strip historic landscape feature should be considered.	High	Moderate adverse (potentially significant)
Site of post-medieval/ modern beacon in Stallingborough (MNL 4263, MNL 4426)	Within Temporary Construction Area	Low	Consideration of siting of Temporary Construction Area facilities during detailed design, to avoid direct physical impacts on the heritage asset(s) in order to preserve in situ.	High	Moderate adverse (potentially significant)

Receptor Name	Receptor Location	Receptor Value	Mitigation Measures	Magnitude of Impact	Effect
Site of World War II anti-landing obstacles (MNL 4640)	Within West Site	Low	Archaeological investigation and recording prior to construction (should archaeological remains of the heritage asset survive).	High	Moderate adverse (potentially significant)
Probable site of World War II bomb crater (MNL 4643)	Within Temporary Construction Area	Very low	Consideration of siting of Temporary Construction Area facilities during detailed design, to avoid direct physical impacts on the heritage asset(s) in order to preserve in situ.	High	Minor adverse (not significant)
Possible site of World War II barrage balloon mooring (MNL 4651)	Within East Site	Low	Archaeological investigation and recording prior to construction (should archaeological remains of the heritage asset survive).	High	Moderate adverse (potentially significant)
Small rectilinear enclosure (MNL 4652)	Potentially within East Site	Low	Archaeological investigation and recording prior to construction (should archaeological remains of the heritage asset survive).	High	Moderate adverse (potentially significant)
Two rows of terraced housing (ACM1)	Directly northeast of the West Site, adjacent to Queens Road	Low	No mitigation proposed.	Medium	Minor adverse (not significant)

14.9 References

Ref 14-1 AECOM (2022a) Immingham Green Energy Terminal, Heritage Desk-Based Assessment.

Ref 14-2 AECOM (2022b) Immingham Green Energy Terminal: Written Scheme of Investigation for GI Watching Brief, Geoarchaeological boreholes, Geophysical Survey and Archaeological Trial Trenching.

Ref 14-3 Ancient Monuments and Archaeological Areas Act 1979 (as amended).

Ref 14-4 CIFA 2022 Code of Conduct.

Ref 14-5 CIfA (2020) Standard and Guidance for Archaeological Field Evaluation. Chartered Institute for Archaeologists, Reading, June 2020.

Ref 14-6 East Inshore and East Offshore Marine Plans 2014, updated 2022,

Ref 14-7 ECUS Ltd (2013) Kings Road Immingham: Desk Based Assessment.

Ref 14-8 Historic England (2017) Historic Environment Good Practice Advice in Planning Note 3, The Setting of Heritage Assets, 2nd edition.

Ref 14-9 Historic England (2019) Statements of Heritage Significance: Analysing Significance in Heritage Assets. Historic England Advice Note 12.

Ref 14-10 Historic England (2016) Preserving Archaeological Remains. Decision-taking for Sites under Development.

Ref 14-11 IEMA (2021) Principles of Cultural Heritage Impact Assessment in the UK.

Ref 14-12 Infrastructure Planning (Decisions) Regulations 2010

Ref 14-13 Lincolnshire County Council Archaeology Handbook 2019

Ref 14-14 National Policy Statement for Ports (NPSP) 2012

Ref 14-15 North East Lincolnshire District Council (2018) Local Plan 2013 to 2032.

Ref 14-16 Planning (Listed Buildings and Conservation Areas) Act 1990

Ref 14-17 Ministry of Housing, Communities and Local Government (2021). National Planning Policy Framework.

Ref 14-18 Ministry of Housing, Communities and Local Government (2021). Planning Practice Guidance.

Ref 14-19 Historic England (2021) Commercial Renewable Energy Development and the Historic Environment. Historic England Advice Note 15.

Ref 14-20 Historic England (2015) Historic Environment Good Practice Advice in Planning Note 2, Managing Significance in Decision-Taking in the Historic Environment.

14.10 Abbreviations and Glossary of Terms

Table 14.7 Glossary and Abbreviations

Term	Acronym	Meaning
Additional mitigation		Mitigation measures which are over and above embedded and standard mitigation measures, and which are required to further reduce the significance of an environmental effect.
Associated British Ports	ABP	One of the UK's leading and best-connected port groups, owning and operating 21 ports and other transport-related businesses across England, Wales and Scotland.
Baseline conditions		The environment as it appears (or would appear) immediately prior to the implementation of the project together with an known or foreseeable future changes that would take place before completion of the project.
Borehole		A hole bored into the ground, usually as part of investigations typically to test the depth and quality of soil, rock and groundwater. A borehole can also be used to dewater the ground.
British Geological Survey	BGS	A body which aims to advance geoscientific knowledge of the United Kingdom landmass and its continental shelf by means of systematic surveying, monitoring and research.
British Standards	BS	Standard produced by the British Standards Institution.
Built heritage		A structure of building of historic value. These structures are visible above ground level.
Chartered Institute for Archaeologists	CIfA	Leading professional body representing archaeologists working in the UK and overseas.
Circa		Meaning approximately, often used in a historic context in reference to a date.
Conservation area		An area designated under section 69 of the Planning (Listed Buildings and Conservation Areas) Act 1990 as being of special architectural or historic interest and with a character or appearance which is desirable to preserve or enhance.
Cropmark		Cropmarks are a means through which sub-surface archaeological, natural and recent features

Term	Acronym	Meaning
		may be visible from the air or a vantage point on higher ground or a temporary platform.
Cultural heritage		Historic monuments, historic groups of buildings and/ or historic sites.
Decommission		The act of ceasing operation of an asset to a non-active status.
Desk-based Assessment	DBA	A desk-based study to assess the likely archaeological potential of a particular site.
Detailed assessment		Detailed field surveys and/ or quantified modelling techniques to understand complex environmental effects.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Effect		Term used to express the consequence of an impact (expressed as the 'significance of effect').
Elements		Parts of environmental factors. For example, listed buildings are part of cultural heritage.
Embedded mitigation		Design measures which are integrated into a project for purpose of minimising environmental effects.
Enclosure		Enclosure (sometimes inclosure) was the legal process in England of consolidating (enclosing) small landholdings into larger farms.
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
Features		Particularly prominent, eye-catching elements or characteristics components such as tree clumps, church towers or wooded skylines.
Future baseline		The likely evolution of the current state of the environment without implementation of the project.
Geology		The physical structure, substance and history of the earth (rocks and minerals).

Term	Acronym	Meaning
Geophysical survey		A process involving ground-based physical sensing techniques to determine the presence or absence of anomalies likely to be caused by archaeological features, structures or deposits.
Ground Investigation	GI	An intrusive investigation undertaken to collect information relating to ground conditions, normally for geotechnical or land contamination purposes.
Hectare	ha	A metric unit of measurement, equal to 2.4.71 acres or 10,000 square metres.
Heritage asset		A building, monument, site, place, area, or landscape of historic value.
Historic		Associated with past human activity.
Historic England		Executive non-departmental public body created under section 32 of the National Heritage Act 1983 to: • Secure the preservation of ancient monuments and historic buildings situated in England. • Promote the preservation and enhancement of the character and appearance of conservation areas situated in England. • Promote the public's enjoyment of, and advance their knowledge of, ancient monuments and historic buildings situated in England and their preservation.
Historic Environmental Record	HER	Historic Environmental Records are sources of, and signposts to, information relating to landscapes, buildings, monuments, sites, places, areas and archaeological finds spanning more than 700,000 years of human endeavour.
Impact		Change that is caused by an action; for example, land clearing (action) during construction which results in habitat loss (impact).
Key characteristics (landscape)		The combination of elements that are particularly important to the current character of the landscape and help to give an area its particularly distinctive sense of place.
Kilometre	km	A unit of measurement
Landscape		An area, as perceived by people, whose character is the result of the action and interaction of natural and/ or human factors.

Term	Acronym	Meaning
Landscape character		A distinct, recognizable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse.
Listed Building		A building or special architectural or historic interest. Listed buildings are graded I, II* or II, with Grade I being the highest. Listing includes the interior as well as the exterior of the building.
Local authority (also local planning authority)		The body officially responsible for all the public services and facilities in a particular area, and which is empowered by law to exercise planning functions.
Metre		A unit of measurement/
Mitigation		Measures intended to avoid, reduce and, where possible remedy significant adverse environmental effects.
Monitoring		An assessment of the performance of the project, including mitigation measures. This determines if effects occur as predicted or if operations remain within acceptable limits, and if mitigation measures are as effective as predicted.
National Grid Reference		A system of geographic grid references, distinct from latitude and longitude.
National Heritage List of England	NHLE	A database of designated heritage assets.
National Planning Policy Framework	NPPF	A planning framework which sets out the Government's planning policies for England and how these are expected to be applied.
National Planning Practice Guidance	NPPG	This is a web-based resource used to support the National Planning Policy Framework.
North East Lincolnshire Council	NELC	The site falls within the administrative boundary of the North East Lincolnshire Council.
Operations		The functioning of project on completion of construction.
Order Limits		The extent of the area within which the Scheme may be carried out.
Ordnance Survey		The national mapping agency for the UK.

Term	Acronym	Meaning
Planning Practice Guidance	PPG	A series of guidance documents which support the content of the National Planning Policy Framework.
Preliminary Environmental Information	PEI	The information referred to in Part 1 of Schedule 4 of the EIA Regulations that has been reasonably compiled by the applicant and is reasonably required to assess the environmental effects of a project.
Preliminary Environmental Information Report	PEI Report	A report that compiles and presents the Preliminary Environmental Information gathered for a project.
Project		Construction works, installations, schemes, or interventions (in the natural surroundings and landscape) including those involving the extraction of mineral resources.
Scheduled Monument	SM	National significant heritage assets protected by the Ancient Monuments and Archaeological Areas Act 1979.
Setting (cultural heritage)		The surroundings in which a heritage asset is experienced.
Significance (of effect)		A measure of the importance of gravity of the environmental effect, defined by generic significance criteria or criteria specific to an environmental topic.
Stakeholder		An organization or individual with a particular interest in the project.
Statutory consultation		Engagement with stakeholders determined or governed by statutory requirements.
Study area		The spatial area within which environmental effects are assessed (i.e. extending a distance from the project footprint in which significant environmental effects are anticipated to occur).
World Heritage Site		World Heritage is the designation for places on Earth that are of outstanding universal value to humanity and as such, have been inscribed on the World Heritage List to be protected for future generations to appreciate and enjoy.
Written Scheme of Investigation	WSI	Documents which set out the approach to undertaking archaeological monitoring of ground investigation works.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 15: Historic Environment (Marine)

Associated British Ports

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Table of contents

Tables

15 Historic Environment (Marine)

15.1 Introduction

15.1.1 This chapter presents the preliminary findings of the assessment of the likely effects of the Project on the Historic Environment (Marine). For more details about the Project, including construction methodology, layout and life span, refer to **Chapter 2: The Project** of this PEI Report.

15.1.2 There may be interrelationships related to the potential effects on Historic Environment (Marine) and other disciplines. Therefore, also refer to the following chapters:

a. **Chapter 14: Historic Environment (Terrestrial)**.

b. **Chapter 16: Physical Processes.**

15.1.3 This chapter is also supported by the following figure:

c. **Figure 15.1**: Marine Heritage Receptors (PEI Report, Volume III).

15.2 Approach to Assessment

Scope

15.2.1 A scoping exercise was undertaken in August 2022 to establish the form and nature of the marine historic environment assessment, and the approach and methods to be followed. The Scoping Report records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on the Historic Environment (Marine) (**Appendix 1.A** (PEI Report, Volume IV)).

15.2.2 The report was submitted to the Planning Inspectorate (PINS) with a request for a Scoping Opinion from them on behalf of the Secretary of State.

15.2.3 Following receipt of the Scoping Opinion (**Appendix 1.B** (PEI Report, Volume IV)) as to the information to be provided in the Environmental Statement (ES) (see **Table 15.1**), there were no additional requirements identified by the Planning Inspectorate which must be taken into account as part of the ongoing Marine Historic Environment assessment.

15.2.4 Having regard to the information presented within the Scoping Report (**Appendix 1.A** (PEI Report, Volume IV)), the Planning Inspectorate's Scoping Opinion (**Appendix 1.B** (PEI Report, Volume IV)) has also confirmed the Applicant's view that significant effects to the setting of marine heritage receptors are unlikely and that impacts on marine archaeology as a result of disposal of dredge arisings are subject to a different regulatory regime. Accordingly, these matters will remain scoped out of consideration in the ES. The scoping responses are set out in **Table 15.1**.

Table 15.1: Scoping Opinion Comments on Historic Environment (Marine)

Consultee	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	The Scoping Report proposes to scope out impacts to the setting of marine archaeological and cultural heritage receptors, as given the existing industrial character of the Site, the Applicant considers it is unlikely for there to be any material additional impacts on the setting of known and unknown heritage receptors during construction or operation. Given the context of the existing baseline environment, the Inspectorate agrees that significant effects to the setting of marine heritage receptors are unlikely to occur, and this matter can be scoped out.	Noted, the assessment of impacts to the setting of marine heritage receptors is scoped out.
	The Scoping Report proposes to scope out impacts on marine archaeology as a result of disposal of dredge arisings, as this activity would take place at licensed marine disposal sites that have been characterised for this purpose, and any heritage conditions associated with the use of such sites would be adhered to. Given the receiving locations and regulatory regime in place, the Inspectorate agrees that this matter can be scoped out of the ES.	Noted, the impacts on marine archaeology as a result of disposal of dredge arisings are scoped out.
Historic England	We are in general agreement regarding the content of the Scoping Report (AECOM: August 2022) and the areas of the Historic Environment which are to be scoped in and out of the assessment. It is important to make sure that the area of the terrestrial and maritime heritage assessments abut or overlap so that no assets are missed and the setting of assets can be assessed as a whole.	The marine historic environment assessment will assess the impact on heritage receptors up to MHWS (see **Paragraph 15.5.1**). This will abut the spatial limit of the terrestrial heritage assessment.
	This development could, potentially, have an impact upon a number of designated and un-designated terrestrial and maritime heritage assets and their settings in the area around the site. In line with the advice in the National Planning Policy Framework (NPPF), we would	Response relevant to the terrestrial heritage assessment (refer to **Chapter 14: Historic Environment (Terrestrial)**).

Consultee	Summary of Response	How comments have been addressed in this chapter
	expect the Environmental Statement to contain a thorough assessment of the likely effects which the proposed development might have upon those elements which contribute to the significance of these assets. Given the heights of the structures associated with the proposed development and the surrounding landscape character, this development is likely to be visible across a very large area and could, as a result, affect the significance of heritage assets at some distance from this site itself. We would expect the assessment to clearly demonstrate that the extent of the proposed study area is of the appropriate size to ensure that all heritage assets likely to be affected by this development have been included and can be properly assessed.	
	It is important that the assessment is designed to ensure that all impacts are fully understood including associated activities (such as construction, servicing and maintenance, and associated traffic) might have upon perceptions, understanding and appreciation of the heritage assets in the area. Section drawings and techniques such as photomontages are a useful part of this. The likelihood of alterations to drainage patterns should also be considered as this may lead to in situ decomposition or destruction of below ground archaeological remains and deposits, and the subsidence of buildings and monuments. We would strongly recommend that you involve the Historic Environment Officers at North and North East Lincolnshire Councils in the development of this assessment. They are best placed to advise on: local historic environment issues and priorities; how the proposal can be tailored to avoid and minimise potential adverse impacts on the historic environment; the nature and design of any required mitigation measures; and opportunities for securing wider benefits for the future conservation and management of heritage assets.	The Historic Environment Officers at North and North East Lincolnshire Councils will be consulted going forward (see **Paragraph 15.4.3**).

15.3 Assessment Method

15.3.1 The Environmental Impact Assessment (EIA) documents including the PEI Report will be prepared following standard industry practice and guidance for marine archaeology, including but not limited to the following:

a. The Assessment and Management of Marine Archaeology in Port and Harbour Development (Ref 15-12);

b. Dredging and Port Construction: Interactions with Features of Archaeological or Heritage Interest) (Ref 15-17);

c. Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment (Ref 15-7);

d. Our Seas – A Shared Resource: High Level Marine Objectives (Ref 15-2); and

e. Ships and Boats: Prehistory to Present: Designation Selection Guide (Ref 15-9).

15.3.2 The EIA will follow the methodology set out in **Chapter 5: EIA Approach**.

15.3.3 The importance of marine heritage receptors will be established using criteria based on Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment (Ref 15-7) and Ships and Boats: Prehistory to Present: Designation Selection Guide (Ref 15-9).

Data and Information Sources

15.3.4 Current baseline conditions have been determined by a desk-based review of available information.

15.3.5 The main desk-based sources of information that have been reviewed to inform the current baseline description within the vicinity of the Project include:

a. United Kingdom Hydrographic Office (UKHO) wreck database;

b. Historic England's National Record of the Historic Environment (NRHE);

c. Various online resources including the British Geological Survey (BGS) Geology of Britain Viewer;

d. Historical maps and Ordnance Survey maps;

e. Admiralty Charts; and

f. Relevant primary and secondary sources in Wessex Archaeology's own library and those available through the Archaeology Data Service and other websites. Both published and unpublished archaeological reports relating to excavations and observations in the area around the study area were reviewed.

15.3.2 At present the North East Lincolnshire Historic Environment Records (HER) service is not available to the public at present, however further attempts will be made to acquire these data for the ES.

15.3.3 The baseline relating to both seabed prehistory and seabed features such as maritime and aviation receptors, will be developed through future archaeological analysis of datasets such as geophysical and geotechnical survey datasets where relevant and available.

15.3.4 An intertidal walkover survey was attempted at low tide on 25th October 2022, but unsafe ground conditions prevented access. Alternative approaches are being considered for the ES baseline.

Determining Significance of Effects

Receptor Sensitivity

15.3.5 In order to assess the potential impacts of a development upon marine cultural heritage, the conceptual approach known as the 'source-pathway-receptor' model is adopted. This approach is based on the identification of the source (i.e. the origin of a potential impact), the pathway (i.e. the means by which the effect of the activity could impact a receptor) and the receptor that may be impacted (e.g. known/potential heritage receptors). For the significance of any given impact to be fully understood and for appropriate mitigation to be proposed, the sensitivity of any marine cultural heritage receptors that may be impacted need to be considered. This section outlines how the sensitivity of marine heritage receptors is ascertained.

15.3.6 The capability of a receptor to accommodate change and its ability to recover if affected is a function of its sensitivity. Receptor sensitivity is typically assessed via the following factors:

a. Adaptability - the degree to which a receptor can avoid or adapt to an effect;

b. Tolerance - the ability of a receptor to accommodate temporary or permanent change without significant adverse impact;

c. Recoverability - the temporal scale over and extent to which a receptor will recover following an effect; and

d. Value - a measure of the receptor's importance, rarity and worth.

15.3.7 Archaeological and cultural heritage receptors cannot typically adapt, tolerate or recover from physical impacts resulting in material damage or loss caused by development. Consequently, the sensitivity of each receptor is predominantly quantified only by its value. In cases where site-specific baseline data is not available, a precautionary approach is typically adopted and potential receptors are considered high sensitivity

Value of a Receptor

15.3.8 Based on Historic England’s Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment (Ref 15-7), the significance of a historic receptor “embraces all the diverse cultural and natural heritage values that people associate with it, or which prompt them to respond to it”.

15.3.9 Within this chapter, value is weighed by consideration of the potential for the receptor to demonstrate the following value criteria:

a. Evidential value – deriving from the potential of a place to yield evidence about past human activity;

b. Historical value – deriving from the ways in which past people, events and aspects of life can be connected through a place to the present. It tends to be illustrative or associative;

c. Aesthetic value – deriving from the ways in which people draw sensory and intellectual stimulation from a place; and,

d. Communal value – deriving from the meanings of a place for the people who relate to it, or for whom it figures in their collective experience or memory. Communal values are closely bound up with historical (particularly associative) and aesthetic values but tend to have additional and specific aspects.

15.3.10 With regards to assessing the value of shipwrecks, the following criteria listed in English Heritage's Ships and Boats: Prehistory to Present – Designation Selection Guide (Ref 15-9) can be used to assess a receptor in terms of its value:

a. Period;

b. Rarity;

c. Documentation;

d. Group value;

e. Survival/condition; and

f. Potential.

15.3.11 These aspects help to characterise each receptor whilst also comparing them to other similar receptors. The criteria also enable the potential to contribute to knowledge, understanding and outreach to be assessed.

15.3.12 The value of known archaeological and cultural heritage receptors were assessed on a four-point scale using professional judgement informed by criteria provided in **Table 15.2** below.

Table 15.2: Criteria to assess the archaeological value of marine receptors

Value	Definition
High	Best known, only example or above average example and / or significant or high potential to contribute to knowledge and understanding and / or outreach. Receptors with a demonstrable international or national dimension to their importance are likely to fall within this category; • Wrecked ships and aircraft that are protected under the Protection of Wrecks Act 1973, Ancient Monuments and Archaeological Areas Act 1979 or Protection of Military Remains Act 1986 with an international dimension to their

Value	Definition
	importance, plus as-yet undesignated sites that are demonstrably of equivalent archaeological value; and • Known submerged prehistoric sites and landscapes with the confirmed presence of largely in situ artefactual material or palaeogeographic features with demonstrable potential to include artefactual and/or palaeoenvironmental material, possibly as part of a prehistoric site or landscape.
Medium	Average example and / or moderate potential to contribute to knowledge and understanding and / or outreach; • Includes wrecks of ships and aircraft that do not have statutory protection or equivalent significance, but have moderate potential based on a formal assessment of their importance in terms of build, use, loss, survival and investigation; and, • Prehistoric deposits with moderate potential to contribute to an understanding of the palaeoenvironment.
Low	Below average example and / or low potential to contribute to knowledge and understanding and / or outreach; • Includes wrecks of ships and aircraft that do not have statutory protection or equivalent significance, but have low potential based on a formal assessment of their importance in terms of build, use, loss, survival and investigation; and, • Prehistoric deposits with low potential to contribute to an understanding of the palaeoenvironment.
Negligible	Poor example and / or little or no potential to contribute to knowledge and understanding and / or outreach. Receptor with little or no surviving archaeological interest.

Impact Magnitude

15.3.13 The magnitude of an impact is defined by a series of factors including the spatial extent of any interaction, the likelihood, duration, frequency and reversibility of a potential impact. The definitions of the levels of magnitude used in this assessment are described in **Table 15.3**.

Table 15.3: Classification of magnitude of impact

Magnitude	Definition
High	Complete or comprehensive physical damage or changes to the character of the receptor
Medium	Considerable changes that affect the character of the receptor, resulting in considerable physical damage

Magnitude	Definition
Low	Minor change that partially affects the character of the receptor, resulting in some physical damage
Negligible	Very minor or negligible change to the character of the receptor, with no or negligible physical damage leading to an imperceptible change to the baseline

Significance Criteria

15.3.14 The significance of effect will be assessed by comparing the value of the receptor against the magnitude of impact. Residual effects (i.e. those remaining after mitigation measures) have been taken into consideration and have been assessed. The overall significance will be assessed using the significance matrix shown in **Table 15.4**. Any effect that is Moderate, Minor or Negligible is not considered significant in this assessment.

Table 15.4: Significance matrix

		Value			
		High	**Medium**	**Low**	**Negligible**
Magnitude/Scale of Change	**High**	Major	Major to Moderate	Moderate	Negligible
	Medium	Major to Moderate	Moderate	Minor to Moderate	Negligible
	Low	Moderate	Minor to Moderate	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

15.4 Legislation, Policy and Guidance

15.4.1 **Table 15.5** presents the legislation, policy and guidance relevant to the marine historic environment assessment and details how their requirements will be met.

Table 15.5: Relevant legislation, policy and guidance regarding Historic Environment (Marine)

Legislation / Policy / Guidance	Consideration within the PEI Report
The Marine and Coastal Access Act 2009 (MCAA) (Part 4) (Ref 15-19)	
Part 4 of the Marine and Coastal Access Act 2009 is relevant to marine development within English territorial waters, implementing a requirement for a marine licence for carrying out	Information relevant to the marine licensing process is provided in the PEI Report including initial baseline assessment of the marine historic

Legislation / Policy / Guidance	Consideration within the PEI Report
certain licensable marine activities (see **Section 15.8**). Whilst the MCAA regulates marine licensing for works at sea, section 149A of the Planning Act 2008 enables an applicant for a Development Consent Order (DCO) to include within the Order a Marine Licence which is deemed to be granted under the provisions of the MCAA.	environment (**Section 15.3**) and a preliminary assessment of potential impacts (**Section 15.5**).
Protection of Wrecks Act 1973: Sections 1 and 2 (Ref 15-20)	
It is an offence to carry out certain activities in a defined area surrounding a wreck that has been designated, unless a licence for those activities has been obtained from the Government.	There are no protected wrecks within the study area (see **Section 15.6**).
Ancient Monuments and Archaeological Areas Act 1979 Section 2 (Ref 15-21)	
It is a criminal offence to carry out any works on, or near to, a Scheduled Monument without Scheduled Monument Consent. Both terrestrial and maritime sites, including wrecks, may be designated under this Act.	There are no scheduled ancient monuments within the study area (see **Section 15.6**).
Protection of Military Remains Act 1986 (Ref 15-22)	
This Act provides protection for the wreckage of military aircraft and designated military vessels. The Act provides for two types of protection: 'protected places' and 'controlled sites'. Military aircraft are automatically protected, although vessels have to be specifically designated. The primary reason for designation is to protect as a 'war grave' the last resting place of servicemen; however, the Act does not require the loss of the vessel to have occurred during the war.	There are no protected places or controlled sites within the study area (see **Section 15.6**).
Merchant Shipping Act 1995 (Ref 15-23)	
All wreck material recovered from UK waters must be declared to the Receiver of Wreck who acts to settle questions of ownership and salvage. 'Wreck' refers to all items of flotsam, jetsam, derelict, and lagan found in or on the shores of the sea or any tidal water. Any wreck material recovered during the Project will have to be reported to the Receiver of Wreck and stored and disposed of according to their instructions.	Baseline characterisation relevant to the Act is undertaken in the PEI Report (**Section 15.3**) and in principle mitigation measures, such as a Protocol for Archaeological Discoveries supports the requirements of the Act.
Treasure Act 1996 (Ref 15-24)	

Legislation / Policy / Guidance	Consideration within the PEI Report
Any material classed as treasure found during the Project must be reported to the Coroner. This includes gold and silver objects, groups of coins, and prehistoric base-metal assemblages. All information required by the Treasure Act (i.e., finder, location, material, date, associated items etc.) will be reported to the coroner within 14 days.	Baseline characterisation relevant to the Act is undertaken in the PEI Report (**Section 15.3**) and in principle mitigation measures, such as a Protocol for Archaeological Discoveries supports the requirements of the Act.
National Policy Statement for Ports (NPSfP) (Ref 15-4)	
The NPSfP recognises the importance of the historic environment and that the construction, operation and decommissioning of port infrastructure has the potential to result in adverse impacts on it (Section 5.12.1). Therefore, the significance of heritage assets and the extent of the impact of the proposed development on the significance of any heritage assets has to be understood (Section 5.12.9). Both designated heritage assets and undesignated heritage assets have to be considered, and the setting of a heritage asset also has to be taken into account. The NPSfP advises that the ES should include: • a description of the significance of the heritage assets affected by the proposed development and the contribution of their setting to that significance. As a minimum, the applicant should have consulted the relevant HER and assessed the heritage assets themselves using expertise where necessary according to the proposed development's impact. (Section 5.12.6); • appropriate desk-based assessment and, where such desk-based research is insufficient to properly assess the interest, a field evaluation (Section 5.12.7); • consideration of the possibility of damage to buried features from underwater disposal of dredged material (Section 5.12.8); and • an assessment of the extent of the impact of the proposed development on the significance of any heritage assets affected (Section 5.12.9). The NPSfP also advises that the assessment should take account of other relevant UK policies and plans, including the Marine Policy	Information relevant to the policy is provided in the PEI Report including initial baseline assessment of the marine historic environment (**Section 15.3**) and a preliminary assessment of potential impacts (**Section 15.5**) and mitigation (**Section 15.6**).

Legislation / Policy / Guidance	Consideration within the PEI Report
Statement (MPS) and any existing marine plans provided for by the MCAA 2009 (Section 4.1.1).	
National Planning Policy Framework (NPPF) (Ref 15-15)	
As part of the NPPF, a core planning principle is to conserve heritage receptors in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of this and future generations (Ministry of Housing, Communities and Local Government, 2021). Section 16 of the NPPF, entitled 'Conserving and enhancing the historic environment', sets out the principal national guidance on the importance, management and safeguarding of heritage assets within the planning process. The NPPF does not contain specific policies for nationally significant infrastructure projects, but it may be a material consideration in DCO applications (Ref 15-15, para. 5)	Information relevant to the policy is provided in the PEI Report including initial baseline assessment of the marine historic environment (**Section 15.3**) and a preliminary assessment of potential impacts (**Section 15.5**) and mitigation (**Section 15.6**).
North East Lincolnshire Local Plan 2013 to 2032 (Ref 15-16)	
The North East Lincolnshire Local Plan, adopted in 2018, recognises the significant role the historic environment plays in providing a "sense of community identity and local distinctiveness, and enhance the aesthetic, social and cultural quality of life available to residents" (p. 218). Policy 39 "*Conserving and enhancing the historic environment' states that "Proposal for development will be permitted where they would sustain the cultural distinctiveness and significance of North East Lincolnshire's historic urban, rural and coastal environment by protecting, preserving and, where appropriate, enhancing the character, appearance, significance and historic value of designated and non-designated heritage assets and their settings*" (p.220). Furthermore, *"Where a development proposal would affect the significance of a heritage assets (whether designated or non-designated), including any contribution made to its setting, it should be informed by proportionate historic environment assessment and evaluations".* This is undertaken by:	Information relevant to the policy is provided in the PEI Report including initial baseline assessment of the marine historic environment (**Section 15.3**) and a preliminary assessment of potential impacts (**Section 15.5**) and mitigation (**Section 15.6**).

Legislation / Policy / Guidance	Consideration within the PEI Report
• *"identifying all heritage assets likely to be affected by the proposal;* • *explain the nature and degree of any effect on elements that contribute to their significance and demonstrating how, in order of preference, any harm will be avoided, minimised, or mitigated;* • *provide a clear explanation and justification for the proposal in order for the harm to be weighed against public benefits; and,* • *demonstrate that all reasonable efforts have been made to sustain the existing use, find new uses, or mitigate the extent of the harm to the significance of the asset; and whether the works proposed are the minimum required to secure the long-term use of the asset."*	
UK Marine Policy Statement (MPS) (Ref 15-13)	
UK Marine Policy Statement (MPS) was adopted by all UK Administrations in March 2011 as part of a new system of marine planning then being introduced across UK seas. The statement facilitates the formulation of Marine Plans, ensuring that marine resources are used in a sustainable way in line with high level marine objectives. Under the MCAA, England was divided into marine planning regions, with an associated authority responsible for preparing a Marine Plan for that area. The MPS sets out the framework for preparing Marine Plans and making decisions affecting the marine environment. The MPS also states that Marine Plans must ensure a sustainable marine environment that will protect heritage receptors. The relevant Marine Plan for the Project is the relevant Marine Plan is the *East Inshore Marine Plan* (Ref 15-3)	Information relevant to the plan's policy is provided in the PEI Report including initial baseline assessment of the marine historic environment (**Section 15.3**) and a preliminary assessment of potential impacts (**Section 15.5**) and mitigation (**Section 15.6**).
East Inshore Marine Plan (Ref 15-3)	
The Marine Management Organisation (MMO) have divided the inshore and offshore waters around England into 11 plan areas for which marine plans are to be produced. The proposed development is within the East Inshore Marine Plan Area which has been adopted as of April 2014.	Information relevant to the plan's policy is provided in the PEI Report including initial baseline assessment of the marine historic environment (**Section 15.3**) and a preliminary assessment of potential impacts (**Section 15.5**) and mitigation (**Section 15.6**).

Legislation / Policy / Guidance	Consideration within the PEI Report
The East Inshore Marine Plan Policy SOC2 states that proposals that may affect heritage receptors should demonstrate, in order of preference: • that they will not compromise or harm elements which contribute to the significance of the heritage asset; • how, if there is compromise or harm to a heritage asset, this will be minimised; • how, where compromise or harm to a heritage asset cannot be minimised, it will be mitigated against; or • the public benefits for proceeding with the proposal if it is not possible to minimise or mitigate or compromise the harm to the heritage asset.	
Managing Lithic Scatters: Archaeological Guidance for planning authorities and developers (Ref 15-5)	
Guidance for planning authorities and developers in case of the discovery of archaeologically significant lithic material.	Assessment has been undertaken following guidance note.
Military Aircraft Crash Sites: Guidance on their significance and future management (Ref 15-6)	
This provides archaeological guidance regarding the significance and future management of military aircraft crash sites. It outlines the importance of aircraft crash sites and indicates that they should be considered where they are affected by development proposals.	Assessment has been undertaken following guidance note (**Section 15.3**)
The Code of Practice for Seabed Developers (Ref 15-14)	
This voluntary code provides a framework for seabed developers similar to the principles found in current policy and practice on land. The aim of the Code is to ensure a best practice model for seabed development. The Code offers guidance to developers on issues such as risk management and legislative implications.	Information relevant to the guidance note is provided in the PEI Report including assessment of potential impacts (**Section 15.5**) and mitigation (**Section 15.6**).
Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment (Ref 15-7)	

Legislation / Policy / Guidance	Consideration within the PEI Report
This document aims to support best practice and decision-making for managing aspects of the historic environment.	Information relevant to the guidance note is provided in the PEI Report including assessment of potential impacts (**Section 15.5**) and mitigation (**Section 15.6**).
Our Seas – A shared resource: High level marine objectives (Ref 15-2)	
A set of objectives agreed by the UK Government, Northern Ireland Executive and Welsh Assembly Government in order to achieve desirable outcomes for the UK marine area as a whole.	Information relevant to the guidance note is provided in the PEI Report including initial baseline assessment of the marine historic environment (**Section 15.3**) and a preliminary assessment of potential impacts (**Section 15.5**) and mitigation (**Section 15.6**).
Environmental Archaeology: A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation (Ref 15-8)	
This document provides guidance for good practice in environmental archaeology, and advice on the applications and methods of environmental archaeology within archaeological projects.	Information relevant to the guidance note is provided in the PEI Report including assessment of potential impacts (**Section 15.5**) and mitigation (**Section 15.6**).
Ships and Boats: Prehistory to Present: Designation Selection Guide (Ref 15-9)	
This guide outlines the selection criteria used when designating ships and boats that are part of the archaeological resource.	Assessment undertaken following guidance note (**Section 15.2** and **Section 15.3**).
Standard and Guidance for Historic Environment Desk-based Assessment (Ref 15-1)	
This guidance seeks to define good practice for the execution and reporting of desk-based assessment, in line with the by-laws of the Chartered Institute for Archaeologists. The standard and guidance was formally adopted as approved practice at the Annual General Meeting of the Institute held on 14 October 1994. This revision recognises the new Chartered status of the Institute.	Assessment undertaken following guidance note (**Section 15.2** and **Section 15.3**).
Marine Geophysics Data Acquisition, Processing and Interpretation Guidance Notes (Ref 15-10)	
These notes were prepared as part of the Aggregates Levy Sustainability Fund's (ALSF) dissemination of heritage information, based on the assessment of a number of ALSF projects. It provides basic information for the characterisation of wreck sites and submerged prehistoric landscapes.	Information relevant to the guidance note is provided in the PEI Report including design, mitigation and enhancement measures (**Section 15.4**).

Legislation / Policy / Guidance	Consideration within the PEI Report
Dredging and Port Construction: Interaction with Features of Archaeological or Heritage Interest (Ref 15-17)	
This guidance document is intended to promote the development of good practice for dredging and port construction in relation to underwater cultural heritage.	Information relevant to the guidance note is provided in the PEI Report including assessment of potential impacts (**Section 15.5**) and mitigation (**Section 15.6**).
Geoarchaeology: Using Earth Sciences to Understand the Archaeological Record (Ref 15-11)	
This guidance covers the use of geoarchaeology in understanding the archaeological record.	Information relevant to the guidance note is provided in the PEI Report including design, mitigation and enhancement measures (**Section 15.4**)
The Assessment and Management of Marine Archaeology in Port and Harbour Development (Ref 15-12)	
This guidance provides practical advice on assessing the impact of port and harbour development in England upon the intertidal and marine historic environment. It is relevant to port and harbour owners, operators, developers and contractors, regulatory authorities, curators, archaeological consultants/contractors and other stakeholders. The document aims particularly at providing advice for environmental assessments required for new development projects, it does not address routine port operations or activities covered under existing Harbour Orders.	Information relevant to the guidance note is provided in the PEI Report including initial baseline assessment of the marine historic environment (**Section 15.3**) and a preliminary assessment of potential impacts (**Section 15.5**) and mitigation (**Section 15.6**).

Stakeholder Engagement

15.4.2 A range of stakeholders have been engaged as part of the scoping process to obtain their views on the Project and the scope of the Historic Environment (Marine) assessment, the results of which are presented within the Scoping Opinion (**Appendix 1.B** (PEI Report, Volume IV)).

15.4.3 Key consultees for marine archaeology include Historic England (HE) and North East Lincolnshire Council (NELC).

15.4.4 Historic England provided a Scoping response to PINS within the statutory deadline. Further engagement with statutory and non-statutory stakeholders will be carried out prior to submission of the DCO Application.

Limitations and Assumptions

15.4.5 The information presented in this preliminary assessment reflects that obtained and evaluated at the time of reporting. It is based on an emerging design for the

Project and the maximum spatial extent required for its construction and operation.

15.4.6 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further; through the assessment and consultation processes; and, as further research and investigative surveys are completed to fully understand its potential effects.

15.4.7 The assessment has been undertaken based on the following assumptions:

a. Data used to compile this report consists of secondary information derived from a variety of sources as detailed in **Section 15.2**. The assumption is made that the secondary data, as well as that derived from other secondary sources, are reasonably accurate.

b. The records held by the UKHO, NRHE, local HERs and the other sources used in this assessment are not a record of all surviving cultural heritage receptors, rather a record of the discovery of a wide range of archaeological and historical components of the marine historic environment. The information held within these sources does not inhibit the subsequent discovery of historic environment receptors that are, at present, unknown.

15.5 Study Area

15.5.1 The study area is the area over which potential direct and indirect effects of the Project that may occur during construction and operation. Direct effects on marine heritage receptors are confined to within the footprint of the Project i.e. the construction works and dredging. Indirect effects are those that may arise due to wider changes in the estuary flow and sedimentary regime and any change to the estuary morphology as a result of the Project.

15.5.2 The study area for the marine archaeology topic will comprise the footprint of the marine works associated with the Project and a 2 km buffer zone. This will be used to capture relevant data on designated and non-designated marine archaeological receptors that may be impacted by the Project, and to provide the necessary context for understanding archaeological potential and heritage significance of the relevant receptors.

15.6 Baseline Conditions

Current Baseline

15.6.1 This section describes the baseline environmental characteristics within the study area with specific reference to marine heritage and marine archaeology.

Marine Heritage Receptors

15.6.2 Marine archaeological and cultural heritage receptors located within the study area can be characterised as comprising four fundamental categories:

a. Seabed prehistory.

b. Maritime archaeology

c. Aviation archaeology.

d. Intertidal heritage receptors.

Seabed Prehistory

15.6.3 The underlying solid geology is Upper Cretaceous Chalk. Locally there are two formations: Flamborough Chalk and Burnham Chalk. The younger Flamborough Chalk has identifiable bedding surfaces, distinct marl bands and is without flint. The underlying Burnham Chalk, along the eastern part of the Site, is thinly bedded and laminated and contains continuous flint bands. The Port of Immingham is located at a point where the Burnham Chalk Formation is not covered by the Flamborough Chalk Formation.

15.6.4 The chalk surface is characterised by a highly fractured zone created by glacial and periglacial processes, and overlain by Pleistocene deposits of Glacial Till. These glacial and post-glacial sequences are subsequently overlain by fine-grained (Clay and Silt) Tidal Flat Deposits.

15.6.5 Beyond areas of industrial development, the area comprises Holocene peats, estuarine alluvium, and tidal flat deposits of sands, silts, and clays.

Maritime, Aviation and Intertidal Archaeology

15.6.6 The marine archaeological and cultural heritage receptors listed in the NRHE and the UKHO wreck database that are located within the study area are listed in **Table 15.6** shown on **Figure 15.1** (PEI Report, Volume III). The section below presents a summary of the baseline.

Table 15.6: Marine Heritage Features

WA ID	External References	Type	Description	Easting	Northing
2001	8508	Mound/Foul ground	A submerged obstruction that was struck by a vessel in 1957. Measured 17.5m by 10.7m and 1m in height. Amended 'dead', i.e. not been observed in repeated surveys, in 2013.	521230	416776
2002	65126	Obstruction	Octagonal obstruction shown on aerial photography.	520765	415966
2003	8505	Dolphin/Foul ground	Remains of a Dolphin damaged or destroyed in 1973 following a collision. Dispersed to seabed level in 1984.	520884	416595
2004	65124	Obstruction	Rectangular obstruction shown on aerial photography	520824	415903

WA ID	External References	Type	Description	Easting	Northing
2005	65128	Obstruction	Octagonal obstruction shown on aerial photography.	520826	415994
2006	8506	Foul ground	Has been lifted.	523601	416697
2007	67016	Dolphins/Poles/ Posts/Piles	Lifted in 1975.	520920	416596
2008	65127	Obstruction	Octagonal obstruction shown on aerial photography.	520788	416015
2009	65125	Obstruction	Cigar shaped obstruction shown on aerial photography.	520833	415905
2010	8576	Wreck	Possible remains of craft recorded between 1991 and 1999. No details are known and it was listed as dead in 2004.	520808	415999
2011	61506	Obstructions	Pipes/Tubes/Diffusers	522245	415235
2012	79895	Foul ground	Observed in bathymetry in 2013. Measures 2 x 1 m with a height of 0.5m.	521181	416806
2013	8509	Wreck	Wreck of *Goldbell*. Has been lifted.	524055	416924
2014	8507	Wreck	A sailing vessel, *Hvitveis*, with auxiliary oil engine that sunk with a cargo of coal in 1915.	522073	416696
2015	98703	Wreck	Unknown wreck shown in ABP Humber survey in 2021.	523985	415716
2016	73629	Wreck	Shown on Humber 8, April 2009 Edition.	520832	416009
2017	66974	Wreck	A light float (No. 9 (Clay Huts) Light Float) that was lifted in 1929.	521037	417063
2018	61507	Obstructions	Pipes/Tubes/Diffusers	524376.51	415045.6
2019	61508	Obstructions	Pipes/Tubes/Diffusers	524311.29	414925.14

WA ID	External References	Type	Description	Easting	Northing
2020	8570	Wreck	Remains of a wooden wreck first discovered in 1985. Measures 27 x 8 x 2.2 m.	524805.16	415312.96
WA = Wessex Archaeology					

15.6.7 Maritime archaeological sites can be considered to comprise two broad categories;

a. The remains of vessels that have been lost as a result of stranding, foundering, collision, enemy action and other causes, and

b. hose sites that consist of vessel-related material.

15.6.8 Vessel-related material includes (but is not limited to) equipment lost overboard or deliberately jettisoned, such as fishing gear, ammunition and anchors or the only surviving remains of a vessel such as its cargo or a ballast mound. Shipwrecks on the seabed provide an insight on the types of vessels used in the past, the nature of shipping activity in the wider area and the changing usage of the marine environment through different periods. Such remains are considered more likely in sediments which promote the preservation of wreck sites (e.g. finer grained sediments that are not subject to high levels of mobility), particularly where such sediments have seen limited, recent disturbance.

15.6.9 There are no sites within the study area that are subject to statutory protection from the Protection of Wrecks Act 1973, the Protection of Military Remains Act 1986 or the Ancient Monuments and Archaeological Areas Act 1979; the three principal statutes that could be used to protect marine archaeological sites.

15.6.10 There are seven records of wrecks in the defined study area. WA 2014, 2015, 2016 and 2020 are wrecks still considered to be located on the seabed. WA 2010 was a wreck that was listed as dead in 2004 i.e. it has not been detected by repeated surveys, although wreck material may still exist at this location. WA 2013 and 2017 are wrecks which have been lifted, and therefore there is possibly no wreck material remaining at these locations, although some debris may remain. Most of these wrecks date to the 20th century, although some are unknown wrecks which may date to other periods. There is the potential for further unknown wreck material to exist.

15.6.11 However, the Port of Immingham was constructed in the early 20th century. This suggests that there is lower potential for pre-20th century wreck material to survive within the Project area, both due to a relatively smaller level of maritime activity prior to the construction of the Port and due to the extensive dredging that has taken place on the adjacent seabed both during construction and since.

15.6.12 Intertidal features located below mean high water springs (MHWS) and above mean low water springs (MLWS) comprise ‘obstructions’ (WA 2002, 2004, 2009) with other examples located adjacently in the river (WA 2005, 2008, 2018, 2019) (**Figure 15.1** (PEI Report, Volume III)).

15.6.13 A variety of other records of 'foul ground' are noted further out into the river also recording dolphins and large debris from 20th century port activity (WA 2001, 2003, 2007) (**Figure 15.1** (PEI Report, Volume III)).

15.6.14 There are also a number of anomalies in the area that are as yet unidentified. WA 2012 is an anomaly that was observed in bathymetry in 2013 and measures 2 m by 1 m with a height of 0.5 m. WA 2001 consists of a submerged obstruction that was struck by a vessel in 1957. This measured 17.5 m by 10.7 m with 1 m in height, but was amended to dead in 2013, although material may still exist at this location. Further obstructions include WA 2006 and 2011.

15.6.15 Marine aviation archaeology receptors comprise the remains or associated remains of military and civilian aircraft that have been lost at sea. Evidence is divided into three primary time periods based on major technological advances in aircraft design, namely: pre-1939; 1939-1945; and post-1945. Although there are currently no known aircraft crash sites located within the study area, there is the potential for the discovery of previously unknown aircraft material. There is particularly high potential for the discovery of aircraft from 1939-1945. There were numerous airfields and local anti-aircraft installations in the vicinity of the Project during the Second World War, with Royal Air Force (RAF) Goxhill and RAF North Killingholme being particularly proximate. Further, the RAF Air Sea Rescue Services are known to have attempted numerous rescues of aircrew from crashed aircraft in the Humber Estuary during the Second World War (Ref 15-18). The remains of crashed military aircraft are protected under the Protection of Military Remains Act 1986 and cannot be disturbed without a licence.

Future Baseline

15.6.16 In the absence of the Project there would be no change to known and potential archaeological marine heritage receptors beyond those caused by natural physical processes and natural deterioration. Physical effects to marine receptors are considered below in terms of likely impacts and effects.

15.7 Design, Mitigation and Enhancement Measures

Embedded Mitigation Measures

15.7.1 The Project has been designed, as far as possible, to avoid and minimise impacts and effects to population and health through the process of design development, and by embedding mitigation measures into the design.

Standard Mitigation Measures

15.7.2 The following mitigation measures are being considered as part of the design development of the Project:

a. Avoidance of known marine cultural heritage receptors (e.g. Archaeological Exclusion Zones).

b. Geoarchaeological and Geophysical data assessment for baseline enhancement.

c. Protocol for Archaeological Discoveries.

Archaeological Exclusion Zones

15.7.3 The primary mitigation for the protection of known archaeological receptors is avoidance. This is commonly achieved through the implementation and monitoring of Archaeological Exclusion Zones (AEZs), which are proposed for identified high value seabed receptors of anthropogenic origin (i.e. A1 classified geophysical anomalies).

15.7.4 The Assessment and Management of Marine Archaeology in Port and Harbour Development (Ref 15-12) states that AEZs are formed by establishing a buffer around the known extents of sites for which the available evidence suggest that there could be archaeological material present on the seabed. The mitigation will establish appropriately sized AEZs around receptors which have been considered to be of high archaeological potential, in consultation with the Archaeological Curators (Historic England). These areas would be out of bounds to construction activities and to anchoring. Monitoring of any AEZs to ensure there is no disturbance to them would be part of this mitigation.

Geoarchaeological and Geophysical data assessment for baseline enhancement

15.7.5 Geophysical surveys undertaken to support the project design, would also be assessed by a suitably qualified archaeological contractor to support baseline enhancement and identification of unknown marine cultural heritage receptors.

15.7.6 Similarly, the geoarchaeological assessment of any future marine borehole logs obtained as part of this detailed design ground investigation would also be undertaken to enhance the baseline understanding of submerged palaeolandscapes.

Protocol for Archaeological Discoveries (PAD)

15.7.7 If previously unknown sites or material are encountered during the different phases of the Project, measures would be taken to reduce the level of impact. In order to provide for these unexpected discoveries a PAD would be adopted. The PAD is a system for reporting and investigating unexpected archaeological discoveries encountered during construction activities, with a Retained Archaeologist providing guidance and advising on the implementation of the PAD.

15.7.8 The PAD also makes provision for the implementation of temporary exclusion zones around areas of possible archaeological interest, for prompt archaeological advice, and, if necessary, for archaeological inspection of important features prior to further activities in the vicinity. The PAD provides a mechanism to comply with the Merchant Shipping Act 1995, including notification of the Receiver of Wreck, and accords with the Code of Practice for Seabed Developers (Ref 15-14) and The Assessment and Management of Marine Archaeology in Port and Harbour Development (Ref 15-12).

15.8 Potential Impacts and Effects

15.8.1 This section identifies the potential likely effects on the marine heritage receptors as a result of the construction and subsequent operation of the Project which have been identified.

15.8.2 The preliminary assessment has identified that the construction phase will potentially result in adverse impacts and effects on marine heritage receptors.

15.8.3 These impacts are associated with:

a. Construction of port infrastructure; and,

b. Capital dredging.

15.8.4 The Physical Processes assessment (**Chapter 16: Physical Processes**) was consulted to assess the damage to known and unknown receptors from indirect impacts.

15.8.5 Cumulative impacts on marine heritage receptors that could arise as a result of other developments and activities in the Humber Estuary have been considered as necessary as part of the cumulative impacts and in-combination effects assessment (see **Chapter 25: Cumulative and In-Combination Effects**).

Construction

15.8.6 This section contains an assessment of the potential impacts to marine archaeology and cultural heritage receptors as a result of the construction phase of the Project. It should be noted that the construction of the Project may be completed in a single stage, or it may be sequenced such that the construction of Berth 2 takes place at the same time as operation of Berth 1 (see **Chapter 2: The Project**). The assessment of impacts on the historic marine environment considers the entire extent of the Project and is considered a 'worst-case' scenario in terms of potential impacts. The assessment will not therefore be altered by a single or sequenced construction period.

15.8.7 The following impact pathways have been assessed:

a. Direct impacts on known and potential marine heritage receptors as a result of construction and capital dredging; and

b. Indirect impacts to known and potential marine heritage receptors due to altered sediment or hydrological processes.

15.8.8 Any direct impacts to marine archaeological receptors are likely to occur during capital dredging activities of the western berth (Berth 1) (see **Chapter 2: The Project**). Impacts resulting in negative effects upon marine archaeology and cultural heritage receptors as part of dredging or marine piling works (for example) are those involving contact with the seabed and/or the removal of seabed sediments.

15.8.9 Any adverse effects, i.e. physical damage, upon marine heritage receptors from direct impacts associated with dredging and marine piling would be permanent and irreversible. As such, the magnitude of direct impacts on known and potential marine heritage receptors, and potential seabed prehistory features as part of

construction and capital dredging activities, if they were to occur, would be high. As a result, if appropriate mitigation is not applied, both the high sensitivity (see **Paragraph 15.3.7**) and the high magnitude of impact on such resources would result in a **major adverse** significance of effect. This is considered to be **significant** in EIA terms.

15.8.10 As a result of the assessment of changes to hydrodynamics and sedimentary processes which predicts a low/negligible exposure to change (see **Chapter 16: Physical Processes**), the magnitude of indirect impacts to marine heritage receptors during the construction phase is expected to be small. Similarly, impacts from construction vessel movements are considered to be localised and temporary, and the magnitude of change is assessed as small.

15.8.11 Therefore, the high sensitivity of potential receptors and low/negligible magnitude of indirect impacts on such resources will result in **negligible** effects, considered **not significant**.

Operation

15.8.12 This section contains an assessment of the potential impacts to marine heritage receptors as a result of the operational phase of the Project. The following impact pathways have been identified:

a. Direct impacts on known and potential marine heritage receptors and deposits of archaeological importance as a result of operational activities and maintenance dredging; and

b. Indirect impacts to known and potential marine heritage receptors due to altered sediment or hydrological processes.

15.8.13 As maintenance dredging takes place in areas where the impact has already occurred for the capital dredge during the construction phase, there is unlikely to be further impact. Therefore, the magnitude of indirect impacts on such resource would result in **negligible** effects, considered **not significant**.

15.8.14 As a result of the assessment of changes to hydrodynamics and sedimentary processes which predicts a **low/negligible** exposure to change (see **Chapter 16: Physical Processes**), the magnitude of indirect impacts to marine heritage receptors during the operation phase is expected to be small. Similarly, impacts from construction vessel movements are considered to be localised and temporary, and the magnitude of change is assessed as small.

15.8.15 Therefore, the high sensitivity of potential receptors and low/negligible magnitude of indirect impacts on such resources will result in negligible effects, considered **not significant**.

Decommissioning

15.8.16 The DCO would not make any provision for the decommissioning of the marine infrastructure above and below water level. This is because the Project would, once constructed, become part of the fabric of the Immingham port estate and would, in simple terms, continue to be maintained so that it can be used for port related activities to meet a long-term need.

15.8.17 Impacts from the decommissioning works were therefore scoped out of EIA.

15.9 Preliminary Assessment of Residual Effects

Construction

15.9.1 The assessment considered two impact pathways from the construction phase in detail. These addressed the potential for direct and indirect impacts on known and potential heritage receptors from construction activities and from capital dredging. No receptors are currently recorded within the Project footprint.

15.9.2 No AEZs are currently being recommended.

15.9.3 Without any mitigation, impacts on potential marine cultural heritage receptors, could result in **major adverse** effects. However, mitigation applied through further investigation could result in the confirmation that:

a. no marine heritage receptors are located within the project footprint, therefore confirming **no adverse** effects; or

b. confirming the presence of marine heritage receptors but ensuring avoidance through AEZs, leading to **negligible** effects.

15.9.4 Should seabed prehistory receptors be confirmed at the site, a **positive** effect could be achieved through contributing to the knowledge base of seabed prehistory receptors, for example through geophysical and geoarchaeological assessment.

Operation

15.9.5 The assessment considered two impact pathways from the operation phase in detail. These addressed the potential for direct and indirect impacts on known and potential heritage receptors from maintenance dredging and operational activities.

15.9.6 Any maintenance dredging works to be carried out during the operational phase will have a relatively small and defined footprint, and significant impacts would have already likely occurred during the construction phase. With the implementation of the appropriate mitigation measures set out above the significance of any direct or indirect effects on marine archaeology will be reduced significantly and the effect predicted to be **negligible** and **not significant**.

Decommissioning

15.9.7 As set out in **Paragraph 15.8.16**, the DCO would not make any provision for the decommissioning of the marine infrastructure above and below water level. No impacts were therefore considered for the decommissioning phase.

15.10 Summary of Preliminary Assessment

15.10.1 A summary of the impact pathways that have been assessed, the identified residual impacts and level of confidence is presented in **Table 15.7** of this Chapter.

Table 15.7: Summary of potential impact, mitigation measures and residual effects

Receptor	Impact Pathway	Pre-mitigation Impact Significance	Mitigation Measure	Residual Effects	Confidence
Construction Phase					
Known marine cultural heritage receptors	Direct impacts on known and potential marine heritage receptors and deposits of archaeological importance as a result of construction and capital dredging	No receptors to consider within the area of impact	-	No significant effects	High
Potential marine cultural heritage receptors		Major adverse	Geophysical and geoarchaeological assessment of project survey data. Then, avoidance of currently unknown receptors, via implementation of AEZs where deemed appropriate and reduction via a PAD.	Negligible	High
Known marine cultural heritage receptors	Indirect impacts to known and potential marine heritage receptors due to altered sediment or hydrological processes.	Negligible	-	Negligible	High
Potential marine cultural heritage receptors		Negligible	-	Negligible	High
Operational Phase					
Known marine cultural heritage receptors	Direct impacts on known and potential marine heritage receptors from maintenance dredging	No receptors to consider within the area of impact	-	No significant effects	-

Receptor	Impact Pathway	Pre-mitigation Impact Significance	Mitigation Measure	Residual Effects	Confidence
Potential marine cultural heritage receptors		Negligible	-	No significant effects	-
Known marine cultural heritage receptors	Indirect impacts to known and potential marine heritage receptors due to altered sediment or hydrological processes.	Negligible	-	Negligible	High
Potential marine cultural heritage receptors		Negligible	-	Negligible	High

15.11 References

Ref 15-1 Chartered Institute for Archaeologists (CIfA) (2014). Standard and guidance for historic environment desk-based assessment. Updated 2020.

Ref 15-2 Defra (2009) Our Seas – A shared resource: High level marine objectives.

Ref 15-3 Defra (2014) East Inshore and East Offshore Marine Plans. London, Defra

Ref 15-4 Department for Transport (2012) National Policy Statement for Ports.

Ref 15-5 English Heritage (now Historic England) (2000). Managing Lithic Scatters: Archaeological Guidance for planning authorities and developers. London, English Heritage.

Ref 15-6 English Heritage (now Historic England) (2002). Military Aircraft Crash Sites: archaeological guidance on their significance and future management. London, English Heritage.

Ref 15-7 English Heritage (2008) Conservation principles, policies and guidance for the sustainable management of the historic environment. London, English Heritage.

Ref 15-8 English Heritage (now Historic England) (2011). Environmental Archaeology: A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation (second edition).

Ref 15-9 English Heritage (now Historic England) (2012). Ships and Boats: Prehistory to Present: Designation Selection Guide. London, English Heritage.

Ref 15-10 English Heritage (now Historic England) (2013). Marine Geophysics Data Acquisition, Processing and Interpretation Guidance Notes. Swindon, English Heritage

Ref 15-11 Historic England (2015) Geoarchaeology – Using earth sciences to understand the archaeological record. Swindon, Historic England

Ref 15-12 Historic England (2016) The Assessment and Management of Marine Archaeology in Port and Harbour Development. Swindon, Historic England

Ref 15-13 HM Government (2011) UK Marine Policy Statement.

Ref 15-14 JNAPC (2006). JNAPC Code of Practice for Seabed Development. York, Joint Nautical Archaeology Policy Committee.

Ref 15-15 Ministry of Housing, Communities and Local Government (2021) National Planning Policy Framework.

Ref 15-16 North East Lincolnshire District Council (2018) Local Plan 2013 to 2032.

Ref 15-17 PIANC (2014) Dredging and Port Construction: Interactions with Features of Archaeological or Heritage Interest.

Ref 15-18 Wessex Archaeology (2008) Aircraft Crash Sites at Sea: A Scoping Study. London. English Heritage.

Ref 15-19 HMSO (2009). Marine and Coastal Access Act 2009.

Ref 15-20 HMSO (1973). Protection of Wrecks Act 1973.

Ref 15-21 HMSO (1979). Ancient Monuments and Archaeological Areas Act 1979.

Ref 15-22 HMSO (1986). Protection of Military Remains Act 1986.

Ref 15-23 HMSO (1995). Merchant Shipping Act 1995.

Ref 15-24 HMSO (1996). Treasure Act 1996.

15.12 Abbreviations and Glossary of Terms

Table 15.8: Glossary and Abbreviations

Term	Acronym	Meaning
Archaeological Exclusion Zone	AEZ	Archaeological Exclusion Zones are the principal means by which any sites or deposits of known or potential archaeological interest bare preserved *in situ*.
British Geological Survey	BGS	A body which aims to advance geoscientific knowledge of the United Kingdom landmass and its continental shelf by means of systematic surveying, monitoring and research
Clay		An inorganic component of soil derived from the weathering of rock and comprising particles less than 0.002mm in equivalent diameter.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
Historic England	HE	Executive non-departmental public body created under section 32 of the National Heritage Act 1983 to: Secure the preservation of ancient monuments and historic buildings situated in England. Promote the preservation and enhancement of the character and appearance of conservation areas situated in England. Promote the public's enjoyment of, and advance their knowledge of, ancient monuments and historic buildings situated in England and their preservation.
Historic Environment Record	HER	Historic Environment Records are sources of, and signposts to, information relating to landscapes, buildings, monuments, sites, places, areas and archaeological finds spanning more than 700,000 years of human endeavour.

Term	Acronym	Meaning
Historic Landscape Characterisation	HLC	A tool to aid identification and interpretation of historical character of an area which considers the landscape and townscape in defining HLC Types.
Holocene	-	The most recent interval of Earth history and includes the present day.
Joint Nautical Archaeological Policy Committee	JNAPC	Formed as a working group on national policy for nautical archaeology.
Multibeam Echosounder	MBES	A multibeam echosounder is a type of sonar that is used to map the seabed.
Marine and Coastal Access Act	MCAA	The Act introduces a new system of marine management. This includes a new marine planning system, which makes provision for a statement of the Government's general policies, and the general policies of each of the devolved administrations, for the marine environment, and also for marine plans which will set out in more detail what is to happen in the different parts of the areas to which they relate.
Marine Management Organisation	MMO	The Marine Management Organisation is an executive non-departmental public body in the United Kingdom established under the Marine and Coastal Access Act 2009, with responsibility for English waters.
Marine Policy Statement	MPS	The UK Marine Policy Statement provides the framework for preparing Marine Plans and is key when making decisions directly affecting the marine environment.
Mean High Water Springs	MHWS	The height of Mean Water High Springs is the average throughout the year, of two successive high waters, during a 24-hour period in each month when the range of the tide is at its greatest.
Mean Low Water Springs	MLWS	The height of mean low water springs is the average height obtained by the two successive low waters during the same period.
Metre	m	A unit of measurement.
National Planning Policy Framework	NPPF	A planning framework which sets out the Government's planning policies for England and how these are expected to be applied.

Term	Acronym	Meaning
National Planning Statement for Ports	NPSfP	The National Policy Statement for Ports provides the framework for decisions on proposals for new port development.
National Record of the Historic Environment	NRHE	A record of terrestrial and marine cultural heritage assets maintained by Historic England.
North East Lincolnshire Council	NELC	The site falls within the administrative boundary of the North East Lincolnshire Council.
North Lincolnshire Council	NLC	The site partially falls within the administrative boundary of the North Lincolnshire Council.
Palaeoenvironment	-	An environment at a period in the geological past.
Planning Inspectorate	PINS	An executive agency with responsibilities for planning appeals, national infrastructure planning applications, local plan examinations and other planning-related casework in England and Wales.
Preliminary Environmental Information	PEI	The information referred to in Part 1 of Schedule 4 of the EIA Regulations that has been reasonably compiled by the applicant and is reasonably required to assess the environmental effects of a project.
Preliminary Environmental Information Report	PEI Report	A report that compiles and presents the Preliminary Environmental Information gathered for a project.
Protocol for Archaeological Discoveries	PAD	The PAD is a system for reporting and investigating unexpected archaeological discoveries encountered during construction activities, with a Retained Archaeologist providing guidance and advising on the implementation of the PAD.
Royal Air Force	RAF	The United Kingdom's air and space force.
Sand		Soil particles from 0.06mm-2.0mm in equivalent diameter. Fine sand particles are from 0.06mm-0.2mm; medium sand from 0.2mm-0.6mm; and coarse sand from 0.6mm-2.0mm.
Silt		Soil particles from 0.002mm to less than 0.06mm in equivalent diameter.
United Kingdom Hydrographic Office	UKHO	The UK Hydrographic Office is a world-leading centre for hydrography, specialising in marine geospatial data to support safe, secure and thriving oceans.

Term	Acronym	Meaning
Wessex Archaeology	WA	Provider of archaeological services to the offshore renewables sector.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 16: Physical Processes

Associated British Ports

Document History

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Table of contents

Tables

16 Physical Processes

16.1 Introduction

16.1.1 This chapter presents the preliminary findings of the assessment of the potential effects of the Project on Physical Processes. For more details about the Project, including construction methodology, layout and life span, refer to **Chapter 2: The Project** of this PEI Report.

16.1.2 This stage identifies the potential environmental changes that result from the proposed activity and the processes that are likely to be affected. These are together referred to as the impact pathways, which have the potential to affect identified receptors (within this and other topic chapters). The following impact pathways have been considered as part of the assessment:

a. Hydrodynamics;

b. Sediment transport;

c. Plume dispersion; and

d. Waves.

16.1.3 Where predicted impacts to these pathways have the potential to subsequently impact specific features of interest (such as the local coastline, nearshore sandbank and channel system, existing berth and jetty infrastructure), these have been identified and considered within the assessment in **Section 16.8**.

16.1.4 There may be interrelationships related to the potential effects on Physical Processes and other disciplines. Therefore, also refer to the following chapters:

a. **Chapter 9: Nature Conservation (Marine Ecology)**;

b. **Chapter 10: Ornithology**;

c. **Chapter 15: Historic Environment (Marine)**;

d. **Chapter 17: Marine Water and Sediment Quality**;

e. **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage**; and

f. **Chapter 19: Climate Change**.

16.1.5 This chapter is also supported by the following figures (PEI Report, Volume III):

a. **Figure 16.1**: Regional setting within wider Humber;

b. **Figure 16.2**: Bathymetric data across Project site;

c. **Figure 16.3:** Particle Size Distribution (PSD) across Project site and disposal grounds;

d. **Figure 16.4**: Project scheme elements;

e. **Figure 16.5**: Maximum excess SSC from peak flood (top) and peak ebb (bottom) disposal at HU060;

f. **Figure 16.6**: Maximum SSC and sedimentation from dredge and disposal across full modelled period;

g. **Figure 16.7**: Timeseries of excess SSC (top) and sedimentation (bottom) at locations down- (left) and up-estuary (right);

h. **Figure 16.8**: Instantaneous excess SSC (top) and sedimentation (bottom) following discrete disposal events;

i. **Figure 16.9**: Peak baseline flows (top) and impact of scheme (bottom) for flood tide (left) and ebb tide (right);

j. **Figure 16.10**: Timeseries of changes to flows and bed shear stress for sites P1, P2, P3 and P4;

k. **Figure 16.11**: Timeseries of changes to flows and bed shear stress for sites P5, P7, P8 and P9;

l. **Figure 16.12**: Timeseries of changes to flows and bed shear stress for sites P6, P10, P11 and P12;

m. **Figure 16.13**: Modelled difference to baseline bed level change over a mean spring neap cycle; and

n. **Figure 16.14**: Modelled change in Hs for 0.5-yr wave event (left) and 50-yr wave event (right) from NE (top), E (middle) and SE (bottom).

16.1.6 A numerical model calibration report (covering each of the different modules) is provided in **Appendix 16.A** (PEI Report, Volume IV).

16.1.7 Numerical modelling tools and conceptual analyses have been used to predict coastal processes and hydrodynamic effects by comparing the baseline and future environmental conditions created by the Project. This includes predicting the changes to tidal water levels, currents, and waves. It also includes modelling of sediment transport pathways (including assessment of potential changes to erosion and accretion patterns) and the fate of sediment plumes from marine construction and maintenance dredging and disposal activities.

16.1.8 Changes in hydrodynamic (and sedimentary) processes are considered in the context of climate change (specifically sea level rise) over the engineering design period of the Project by assessing the effects under projected future sea levels. As further sampling data are acquired this information will be analysed to optimise the construction and dredging methods and minimise changes in physical processes during construction and operation. Some existing ground investigation data does exist, which has been used to inform the sediment transport and dredge plume modelling. Additionally, this data will be used to inform the specifications of the project specific ground investigation (GI) works.

16.1.9 Preliminary modelling has been completed using existing models of the Humber Estuary, with updates to ensure mesh resolution and model performance across the primary study area remains suitable. The modelling utilises the state of the art Mike suite of modelling software from the Danish Hydraulics Institute (DHI). These modelling tools have previously been developed specifically for oceanographic, coastal and estuarine applications within the Humber region. The selected modelling tools have been updated with the latest available bathymetric

and topographic data and have undergone a further verification stage using local measurements collected for the Project (see **Appendix 16.A** (PEI Report, Volume IV)).

16.1.10 Following the refinement of the models to replicate the baseline conditions, the models have then been updated to include a representation of the marine elements of the Project, namely the jetty, the dredge footprint and the dredge disposal site(s). The models also include a representation of any other coastal and marine developments that may overlap or interact with the Project to allow the potential for cumulative effects to be assessed.

16.1.11 There is sufficient available information and data sources to support the numerical modelling and conceptual analyses and no further field survey work is considered necessary. Where relevant, additional information from planned surveys will be used to validate model results, e.g. sediment sampling carried out in line with OSPAR[1] requirements.

16.2 Approach to Assessment

Scope and Methods

16.2.1 A scoping exercise was undertaken in August 2022 to establish the form and nature of the Physical Processes assessment, and the approach and methods to be followed.

16.2.2 The Scoping Report (**Appendix 1.A** (PEI Report, Volume IV)) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on Physical Processes.

16.2.3 Following receipt of the Scoping Opinion (**Appendix 1.B** (PEI Report, Volume IV)) as to the information to be provided in the Environmental Statement (ES), the requirements set out in **Table 16.1** have been identified by the Planning Inspectorate as those to be taken account of as part of the ongoing physical processes assessment.

[1] 'OSPAR' relates to the Convention for the Protection of the Marine Environment of the North-East Atlantic.

Table 16.1: Scoping Opinion Comments on Physical Processes

Consultee	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	The Scoping Report refers to physical environmental receptors "such as the local coastline and the nearshore sandbank and channel system, along with existing berth and jetty infrastructure". The ES must clearly describe the receptors to be considered in the assessment and explain how/why they were identified. The ES should consider whether the changes to physical processes would impact on sea defences through changes to wave patterns or sedimentation, and the likelihood of impacts on any telemetry devices in the area of Immingham docks.	Receptor pathways have been identified as, sediment transport, plume dispersion and waves. For each of these receptor pathways, the potential impacts on the local coastline (including existing defences), nearshore sandbank and channel system, existing berth and jetty infrastructure have been assessed in **Section 16.5**.
	The Scoping Report states that for impacts on physical receptors (i.e. local coastline, sandbank and channel system, existing infrastructure) an assessment of effect significance would be undertaken following the methodology presented in section 4.6 of Chapter 4 The EIA Process. The ES should explain and justify how the evaluation of the importance/ value and sensitivity of relevant physical processes receptors has been undertaken, and how the magnitude of impact has been defined for this aspect.	The approach to the assessment for physical processes is outlined in **Section 16.2**. Where applicable, the assessment for physical processes receptors is carried out in line with the EIA methodology in **Chapter 5: EIA Approach**.
	Item J mentions relevant local policy and we would highlight the need to consider the relevant Shoreline Management Plan and Humber Estuary schemes/plans in relation to this topic.	Reference is made to local planning policy and plans including the River Basin Management Plan and Shoreline Management Plan and information has been provided as to the relevance of these plans to the Project in relation to physical processes (**Table 16.2** in **Section 16.2**).
Environment Agency	This Chapter sets out what will be done to assess the changes to physical processes and what these impacts will be. We are pleased that at this stage no issues have been scoped out. However, we would like the assessment to also specifically	Preliminary modelling of wave patterns and sediment transport has been carried out and the assessment is presented in **Section 16.5**.

Consultee	Summary of Response	How comments have been addressed in this chapter
	consider whether the changes to physical processes would have an impact on sea defences through changes to wave patterns or sedimentation. Paragraph 15.4.8 states that the jetty will not be decommissioned and is likely to remain part of the port estate. An engineering standard of 50 years has been given for the development. If the jetty is to remain in place longer than 50 years, the assessments need to reflect this in an appropriate design life for the marine element of the proposed development. Paragraph 15.6.9 summarises the relevant legislation, policy and technical guidance, which will be cross-referenced as appropriate. Item J mentions relevant local policy and we would highlight the need to consider the relevant Shoreline Management Plan and Humber Estuary schemes/plans in relation to this topic.	The Shoreline Management Plan and other plans relevant to the Humber Estuary have been considered and are detailed in **Table 16.2**.

16.3 Assessment Method

16.3.1 The methods adopted for the assessment of the physical processes changes differs slightly to those adopted for other environmental topics. This is because whilst the Project has the potential to cause changes to hydrodynamic and sedimentary processes, these changes are not, in themselves, generally recognised as environmental features/ receptors and, therefore, do not equate to 'effects'. The effects would instead be the consequence of these changes on other environmental features. For example, 'changes' in the transport and deposition of sediment may 'effect' the structure and function of marine habitats and their associated species.

16.3.2 The physical processes assessment applies the same impact assessment methodology as described in **Chapter 5: EIA Approach** and assesses the potential 'exposure to change' resulting from the impact pathways that have been scoped into the assessment. The consequent significance of effects resulting from physical processes changes on other environmental features/ receptors would be assessed in other topic-specific ES chapters, including **Chapter 9: Nature Conservation (Marine Ecology)**; **Chapter 10: Ornithology**; **Chapter 15: Historic Environment (Marine)**; **Chapter 17: Marine Water and Sediment Quality**; and **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage**.

16.3.3 It is recognised, however, that physical processes changes may potentially impact on physical environmental receptors, such as the local coastline and the nearshore sandbank and channel system, along with existing berth and jetty infrastructure. For these physical receptors, therefore, an assessment of effect significance is undertaken following the methodology presented in **Chapter 5: EIA Approach**. In accordance with published guidance and an established approach that has been used in numerous previous EIAs, the assessment includes an evaluation of the importance/ value and sensitivity of relevant physical processes receptors.

16.4 Legislation, Policy and Guidance

16.4.1 **Table 16.2** presents the legislation, policy and guidance relevant to physical processes assessment and details how their requirements will be met.

Table 16.2: Relevant legislation, policy and guidance regarding Physical Processes

Legislation / Policy / Guidance	Consideration within the PEI Report
The Marine and Coastal Access Act 2009 (MCAA) (Ref 16-2)	
The MCAA provides the legal mechanism to help ensure clean, healthy, safe, productive, and biologically diverse oceans and seas by putting in place a new system for improved management and protection of the marine and coastal environment. The MCAA established the Marine Management Organisation (MMO)	Information relevant to the marine licensing process is provided in the PEI Report including characterisation of the physical processes baseline (**Section 16.3**) and a preliminary assessment of the exposure to change and potential impacts (**Section 16.5**).

Legislation / Policy / Guidance	Consideration within the PEI Report
as the organisation responsible for marine planning and licensing. The Project will require a Marine Licence for the elements of the works below Mean High Water Springs including dredging, disposal and placing or removing objects on or from the seabed. For NSIPs the Development Consent Order (DCO) where granted may include provision deeming a marine licence to have been issued under Part 4 of the Marine and Coastal Access Act 2009. The MMO is responsible for enforcing, post-consent monitoring, varying, suspending, and revoking any deemed marine licence(s) as part of the DCO.	
The Planning Act 2008 (PA2008) (Ref 16-3)	
Whilst the MCAA regulates marine licensing for works at sea, section 149A of the Planning Act 2008 enables an applicant for a DCO to include within the Order a Marine Licence which is deemed to be granted under the provisions of the MCAA.	Information relevant to the marine licensing process is provided in the PEI Report including characterisation of the physical processes baseline (**Section 16.3**) and a preliminary assessment of the exposure to change and potential impacts (**Section 16.5**).
The Water Environment (WFD) (England and Wales) Regulations 2017 (Ref 16-4)	
The Water Framework Directive (2000/60/EEC) is transposed into UK law through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 as amended, known as the Water Framework Regulations[2]. In terms of water and sediment quality, *"Good ecological status/potential"* has regard to physico-chemical quality elements, and specific pollutants. The Good ecological status/potential assessment also considers biological and hydromorphological elements. "Good chemical status" has regard to a series of priority substances and priority hazardous substances.	The WFD surface water bodies are described in **Chapter 17: Marine Water and Sediment Quality**. A WFD Compliance Assessment will be prepared to support the DCO application. This includes consideration of the potential risks for several key receptors, including hydromorphology. The WFD Compliance Assessment will be informed by the outcomes of the physical processes assessment reported within this chapter.
The Conservation of Habitats and Species Regulations 2017 (Ref 16-5)	
The Habitats Directive and Birds Directive are transposed into UK law through the Conservation of Habitats and Species	**Section 16.3** characterises the baseline for physical processes. A preliminary assessment of the exposure to change and potential impacts is described in

[2] Following the UK leaving the EU, the main provisions of the WFD have been retained in English law through The Floods and Water (Amendment etc.) (EU Exit) Regulations 2019.

Legislation / Policy / Guidance	Consideration within the PEI Report
Regulations 2017 as amended, known as the "Habitats Regulations"[3]. The Habitats Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species' and the adaptation of planning and other controls for the protection of European Sites. The Regulations also require the compilation and maintenance of a register of European sites, to include SACs (classified under the Habitats Directive) and SPAs (classified under the Birds Directive). These sites form the Natura 2000 network. These regulations also apply to Ramsar sites (designated under the 1971 Ramsar Convention for their internationally important wetlands), candidate SACs (cSAC), potential Special Protection Areas (pSPA), and proposed and existing European offshore marine sites.	**Section 16.5** which has informed the preliminary assessment of impacts on protected habitats and species presented in **Chapter 9: Nature Conservation (Marine Ecology)** and **Chapter 10: Ornithology**. In particular information is provided with respect to the following potential impact pathways: • Physical damage through disturbance and/or smothering of supporting habitats and associated prey resources for interest features. • Physical damage through alterations in physical processes of supporting habitat for interest features. • Non-toxic contamination through elevated SSC resulting in effects on interest features, or their prey resources. A Habitats Regulations Screening report has been produced and is provided in **Appendix 9.C** (PEI Report, Volume IV). This report will inform the consultation process and will aid the Competent Authorities[4] in determining whether the Project has the potential for a likely significant effect (LSE) on the interest features and/or supporting habitat of a European/Ramsar site either alone or in-combination with other plans, projects and activities and, if so, will inform the requirement to undertake an Appropriate Assessment (AA) of the implications of the proposals in light of the site's conservation objectives.
The Waste (England and Wales) Regulations 2011 (as amended) (Ref 16-8)	
The Regulations set out the measures required for the prevention of, production and management of waste. This describes the purpose of a waste prevention program with waste prevention measures and makes reference to monitoring by appropriate authorities using qualitative or quantitative benchmarks. It also outlines the waste hierarchy which ranks waste management options according to what is best for the environment. It gives top priority to preventing waste in the first place. When waste is created, it gives priority to preparing it for re-use, then	**Section 16.3** provides baseline information on sediment characteristics. This information will inform a Waste Hierarchy Assessment (WHA) for the Project which would be undertaken to determine the Best Practical Environmental Option (BPEO) for dealing with the dredge arisings (see **Chapter 5: EIA Approach**. The WHA would be informed by the outcomes of this physical processes assessment. The option of disposal in the estuary will be assessed as part of this physical processes assessment and is described in **Section 16.5**.

[3] Following the UK leaving the EU, the Conservation of Habitats and Species Regulations 2017 have been modified by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019.

[4] The MMO and North East Lincolnshire are Competent Authorities for the HRA. However it is noted that ABP is also a Competent Authority under the UK Habitats Regulations.

Legislation / Policy / Guidance	Consideration within the PEI Report
recycling, then recovery, and last of all disposal (e.g. landfill). For any dredging project, the *in situ* characteristics of the material (physical and chemical), the method and frequency of dredging (and any subsequent processing), determines its characteristics in the context of securing a consent that is in compliance with the waste hierarchy. This understanding is central to the consideration of management options for dealing with dredged material in light of the requirements of the Regulations. Where prevention of the dredging is not possible, then the volume to be dredged should be minimised, and options for the re-use of the material, recycling and other methods of recovery must be considered in the first instance. In the context of re-use and recycling of dredge material this could include engineering uses, agricultural and product uses, environmental enhancement or post treatment of the dredge material to change its character with a view to determining a potential use. Should no practical and cost-effective solutions be identified, only then can options for the disposal of the dredged material be considered. These include marine disposal in licensed deposit sites or land-based disposal in terrestrial landfill.	
National Planning Policy Statement for Ports (NPSfP) (Ref 16-9)	
The NPSfP provides the policy framework for nationally significant infrastructure projects involving new port development (DfT, 2012). In order to meet the requirements of the Government's policies on sustainable development, the NPSfP requires that new port infrastructure should also, amongst other things, assess the impact on coastal processes, be adapted and resilient to the impacts of climate change and provide high standards of protection for the natural environment. It also advises in Paragraph 5.3.5 that applicants should assess the impact of the proposed project on coastal processes and geomorphology, including by taking account of potential impacts from climate change. If the development has an impact on coastal processes, the applicant must demonstrate	A physical processes chapter has been prepared for the PEI Report. A preliminary assessment of the exposure to change and potential impacts on physical processes is described in **Section 16.5**.

Legislation / Policy / Guidance	Consideration within the PEI Report
how the impacts will be managed to minimise adverse impacts on other parts of the coast. Paragraph 5.3.5 of the NPSfP advices that applicants also to assess the vulnerability of the proposed development to coastal change in the context of climate change during the project's operational life and any decommissioning period. Paragraph 5.3.8 states that the decision-maker should be satisfied that the proposed development will be resilient to coastal change, taking account of climate change, during the project's operational life and any de-commissioning period.	
UK Marine Policy Statement (MPS) (Ref 16-10)	
The MPS is the framework for preparing marine plans and taking decisions affecting the marine environment. The MPS also sets out the general environmental, social, and economic considerations that need to be taken into account in marine planning and provides guidance on the pressures and impacts that decision makers need to consider when planning for and consenting development in the UK marine areas. Section 2.6.8 of the MPS is relevant to the Physical Processes assessment. In particular, paragraph 2.6.8.4 states, amongst other things, that - *"Marine plan authorities should be satisfied that activities and developments will themselves be resilient to risks of coastal change and flooding and will not have an unacceptable impact on coastal change..."*. In addition, paragraph 2.6.8.6 notes that the impacts of climate change throughout the operational life of a development should be taken into account in assessments, and that any geomorphological changes that an activity or development has on coastal processes, including sediment movement, should be minimised and mitigated.	A physical processes chapter has been prepared for the PEI Report. A preliminary assessment of the exposure to change and potential impacts on physical processes is described in **Section 16.5**. Where relevant mitigation has been considered in **Section 16.4**.
UK Marine Strategy (Ref 16-11)	
The aim of the UK Marine Strategy is to protect the UK's marine environment. The Strategy sets out a comprehensive framework for assessing, monitoring, and taking action to achieve the UK's shared vision for clean,	The anticipated pressures exerted on the marine environment by the Project are considered to be of sufficiently small magnitude, in the context of UK Marine Regions, that they are unlikely to be a significant issue. The Strategy is, therefore, not

Legislation / Policy / Guidance	Consideration within the PEI Report
healthy, safe, productive, and biologically diverse seas. It aims to achieve good environmental status of marine waters by 2020 (followed by a six-year review) and then to protect the resource base upon which marine-related economic and social activities depend. The Strategy constitutes a vital environmental component of future maritime policy, designed to achieve the full economic potential of oceans and seas in harmony with the marine environment. The UK Marine Strategy applies to the landward boundary of coastal waters as defined under the WFD (i.e., from mean high water springs (MHWS)) to the outer limit of the UK Exclusive Economic Zone (EEZ), as well as the area of UK continental shelf beyond the EEZ. Government reporting against the Strategy is a cyclical process, and the most recent assessments and Marine Strategy documents were updated in 2019.	considered further in this PEI Report with regards to the physical processes assessment.
East Inshore and East Offshore Marine Plans (Ref 16-12)	
The first Marine Plans include the East Inshore and East Offshore Marine Plans, which are collectively referred to as 'the East Marine Plans'. These were formally adopted on 2 April 2014 (Defra, 2014). There are no policies within the East Marine Plans related specifically to coastal processes. Policy CC1, however, states that: *"Proposals should take account of:* *• how they may be impacted upon by, and respond to, climate change over their lifetime; and* *• how they may impact upon any climate change adaptation measures elsewhere during their lifetime. Where detrimental impacts on climate change adaptation measures are identified, evidence should be provided as to how the proposal will reduce such impacts."*	With respect to this physical processes assessment, the future baseline is discussed in **Section 16.3**, to provide context to the predicted changes (as a result of the Project) which are described in **Section 16.5**.
Flamborough Head to Gibraltar Point Shoreline Management Plan (SMP) (Ref 16-13)	
The Flamborough Head to Gibraltar Point SMP identifies the most sustainable approach for managing the risk from coastal flooding and erosion over the short, medium and long-term.	The PEI Report recognises that the Project lies adjacent to Policy Unit L 'East Immingham to Cleethorpes' where the policy in the short, medium and long term is 'Hold the Line' will influence current and future baseline conditions (**Section 16.3**).

Legislation / Policy / Guidance	Consideration within the PEI Report
IT covers the Humber Estuary coastline up to Immingham.	
North East Lincolnshire Local Plan 2013 to 2032 (Ref 16-14)	
The North East Lincolnshire Local Plan was adopted in 2018 and covers the period 2013 to 2032. Within its Spatial Portrait, the Local Plan highlights the importance of the 'Estuary Zone' of the local authority area, which includes the 'nationally important port' of Immingham. When considering the detail of how the economy of the area will be developed, the Plan specifically identifies at the outset that there are good expectations of growth within the ports and logistics sector. On the policies map which accompanies the Local Plan, the site of the Project is shown as being located within an area identified as 'Employment – Operational Port'. In addition, Policy 34 of the plan makes clear that: *"Water management* *1. Development proposals that have the potential to impact on surface and ground water should consider the objectives and programme of measures set out in the Humber River Basin Management Plan."* The Humber River Basin Management Plan provides a framework for protecting and enhancing the benefits provided by the water environment within the Humber River Basin District and informs decisions on land-use planning. The Humber River Basin District covers an area of 26,100 km² and extends from the West Midlands in the south, northwards to North Yorkshire and from Staffordshire in the west to part of Lincolnshire and the Humber Estuary in the east	The Project is located largely within the administrative area of North East Lincolnshire, although elements of the marine infrastructure fall beyond the local Council's administrative boundary. A preliminary consideration of impacts on physical processes is provided in **Section 16.5**. This will also be assessed in the WFD Compliance Assessment which will be submitted with the DCO application and will consider WFD objectives as outlined in the Humber River Basin Management Plan.
PINS Advice Note Eighteen: The Water Framework Directive (Ref 16-15)	
Advice Note Eighteen (Planning Inspectorate, 2017) explains the information that the Inspectorate considers an applicant must provide with their Nationally Significant Infrastructure Project (NSIP) application in order to clearly demonstrate that the WFD and the Water Environment (WFD) (England and	The WFD Compliance Assessment for the Project will contain the information specified in this guidance as appropriate. The WFD Compliance Assessment will be informed by the outcomes of the physical processes assessment in **Section 16.5**.

Legislation / Policy / Guidance	Consideration within the PEI Report
Wales) Regulations 2017 have been appropriately considered. The Advice Note also refers to Environment Agency guidance (as described above) in terms of the WFD process and the information required. Furthermore, the guidance describes the relevant bodies to be consulted in the pre-application process, and the presentation of information.	

Stakeholder Engagement

16.4.2 A range of stakeholders have been engaged as part of the scoping process to obtain their views on the Project and the scope of the Physical Processes assessment, the results of which are presented within the Scoping Opinion (**Appendix 1.B** of PEI Report, Volume IV).

Limitations and Assumptions

16.4.3 The information presented in this preliminary assessment reflects that obtained and evaluated at the time of reporting and is based on an emerging design for the Project and the maximum likely extent of land required for its construction and operation.

16.4.4 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further through the assessment and consultation processes, and as further research and investigative surveys are completed to fully understand its potential effects.

16.4.5 This preliminary assessment has been undertaken based on the following assumptions:

a. The Project is implemented as described in **Chapter 2: The Project** (with regards berth pocket location, depths, jetty and pontoon pile locations and dimensions).

b. Numerical modelling is based on a scenario with all elements of infrastructure in place including up to two berths and is considered a 'worst-case' scenario.

c. The dredging requirements for the Project will involve the use of a backhoe dredger (e.g. Mannu Pekka or similar) and potentially trailing suction hopper dredger (TSHD) (e.g. Cork Sand and Long Sand or similar). The backhoe dredging will involve the excavated material being loaded directly to attendant barges for disposal. Dredge operations will be continuous and operate 24 hours a days and seven days a week until the full dredge volume has been removed.

d. There will be subsequent transit of material and disposal at existing licensed disposal sites HU056 and HU060 (as described in **Section 16.5**). Where necessary, any inerodible boulder/glacial clay would be disposed of at site

HU056, whilst HU060 is to be used to dispose of any sand/silt (alluvium) material.

e. Following construction of the Project, vessels operating from the newly constructed berth(s) are assumed with dimensions described in **Chapter 2: The Project**.

f. That barge access to the disposal sites can be achieved throughout the full tidal cycle (this is considered to be a conservative, worst-case assumption for dredging and disposal operations and the subsequent plume development).

g. The dredge volumes assumed are a total of approximately 100,000 m^3. This value (including a split across material type) will be confirmed by sediment sampling carried out in line with OSPAR requirements.

16.4.6 Whilst these are assumptions, the preliminary assessment within this PEI Report has been undertaken considering the anticipated worst-case scenario in respect of physical processes receptors across the wider study area, including at the dredge, piling and disposal locations. Specific assumptions (and associated methodology) for each assessment are detailed in the relative sections of **Section 16.8**.

16.5 Study Area

16.5.1 The study area for this assessment is the area over which potential direct and indirect effects of the Project are predicted to occur during the construction and operational periods.

16.5.2 The direct effects on physical processes are those confined to the areas within the footprint of the Project, i.e., the piers, pontoons, dredged berth pocket and disposal of dredge material at the proposed disposal sites.

16.5.3 Indirect effects are those that may arise due to wider changes in the estuary flow and sedimentary regime and any associated change to the estuary morphology as a result of the Project.

16.5.4 As a consequence, the study area for the physical processes topic comprises the Project site and the adjacent Immingham coastline, the existing jetties across the near-field and the central part of the Humber Estuary, the area generally between Sunk Dredged Channel (SDC) and Halton Middle and the proposed spoil grounds HU056 and HU060. Within the far-field region, the study area includes the wider Humber Estuary from the mouth to up-estuary of the Hull Bend (see **Figure 16.1** (PEI Report, Volume III) for locations).

16.6 Baseline Conditions

Existing Baseline

16.6.1 The description of the existing baseline draws on available information from new and existing surveys, reports, dredging records and publicly available data. Additional, project-specific surveys are currently underway, and the results will be used to update the baseline characterisation within the ES.

Bathymetry and morphology

16.6.2 In plan shape, the Humber Estuary has a meandering funnel shape widening towards the mouth, where a southerly orientated spit has formed in response to littoral drift processes and antecedent geological controls. The funnel shape is demonstrated by the exponential decrease in estuary area, width, and depth from the mouth to the head.

16.6.3 The estuary can be divided into three regions (see **Figure 16.1** (PEI Report, Volume III) for locations):

a. The Inner Humber (Trent Falls to Humber Bridge).

b. The Middle Humber (Humber Bridge to Grimsby).

c. The Outer Humber (Grimsby to Spurn Point).

16.6.4 In the Inner Humber, downstream of Trent Falls, where the River Trent and River Ouse merge, the estuary is characterised by a number of extensive intertidal banks composed of sand/silt. These banks include Winteringham Middle Sand, Redcliff Middle Sand, Hessle Sand and Barton Ness Sand.

16.6.5 The Middle Humber, where the Project is located, is similar in its characteristics to the Inner Humber, having a number of banks and channels which have a preferred configuration. In the northernmost section, the main channel lies close to the Hull Waterfront, but westwards, where it meets Hessle Sand, a secondary channel develops along the southern shore. Down-estuary this reach is dominated by Skitter and Foul Holme Sands.

16.6.6 The Outer Humber is dominated by a three-channel system at the mouth (offshore of Spurn Head), a large, submerged sandbank (the Middle Shoal, located approximately in the middle of the estuary offshore of Grimsby), and a single deep channel leading to the Middle Humber. The three channels are Haile Channel (to the south of the mouth of the Humber), Hawke Channel (to the northern side of the mouth, located off the tip of Spurn Head) and Bull Channel (in between the two). Up-estuary, Hawke Channel is extensively dredged and the resulting channel, known as Sunk Dredged Channel (SDC), provides shipping access to the ports of Immingham and Hull. The presence of boulder clay deposits in the Outer Humber provides a geological constraint that influences the position of some of the sand banks, intertidal areas and Spurn Point itself. The Outer Humber contains a number of disposal grounds.

16.6.7 The Humber Estuary has a macro tidal range, fast flows and a high background suspended sediment content. This means the bed of the estuary is very dynamic in its morphology, both in the short term and on longer time scales, particularly in areas where there are no constraints, either geological or man-made. This dynamism manifests itself in cyclical variations in the positions of channels and banks throughout different regions of the estuary, with many of these regions showing an interconnectivity of process. The dominant influences on morphological change are tides, waves and freshwater flows, tidal surges and biological activity.

16.6.8 These influences produce changes in SSC, deposition rates, bed composition and ultimately channel/bank configurations. The dynamic nature of the Humber is

illustrated by the interactions existing between the various bank systems in the Inner and Middle Humber. Channel migration in the Inner Humber releases sand, which forms banks off Barton and New Holland in the Upper Middle Humber. Furthermore, there is a sediment exchange between Barton Ness Sand and Skitter Sand lower down the Humber, which ultimately helps determine the shape and levels across Halton Flats. This variability in the banks and channels has been particularly noticeable around the Hull Bend during the last circa 20 to 25 years, with large changes to the intertidal banks and secondary channels in the areas of Hull Middle, Skitter Sand and Halton Flats.

16.6.9 Further down-estuary, between Immingham and Grimsby, the estuary is at its deepest, and relatively speaking, this is its most stable location. The main channel varies between 10m and 20m below Chart Datum (CD) and is bounded by steep 'hard sides' thought to comprise boulder clay, which are relatively in-erodible to present-day hydrodynamics. On the south side of the channel a relatively wide and gently sloping shallow subtidal 'ledge' exists, predominantly associated with the construction of the Grimsby Dock System. To the north, near Hawkins Point, the intertidal area is narrow compared to the areas up and down the estuary. This is due to human intervention through the reclamation of Sunk Island in this area.

16.6.10 Across the Project, the near field bathymetry is influenced by the deeper approaches to the Port of Immingham and the relatively shallower subtidal region behind the existing jetties (**Figure 16.2** in PEI Report, Volume III). Bed elevation within the approaches to Immingham, the SDC and on the berths at IOT varies in the approximate range of -8m to -20 mCD. Across the Project site, bed levels range from around -16 mCD offshore, sloping up towards the land along the Immingham foreshore. The intertidal area adjacent to the Project is around 100 m in width, narrowing slightly to the south, to around 80 m south of the landward end of the jetty(s).

16.6.11 A review of historical bathymetric charts extending both up and down estuary of the Project shows that in the 1930s, the channel up estuary was considerably deeper than present day, with depths of the order of -16 mCD centred about 1km from the shoreline. The channel has consistently in-filled until about 1990, resulting in a depth of around -7 mCD. During the last 15 years, depths have been relatively stable, although variations between -6m and -7mCD have occurred in Whitebooth Road (**Figure 16.1** in PEI Report, Volume III). Around the Project site (including Stallingborough Flats and the wider Immingham frontage), bed levels have remained relatively stable over time.

Tides and water levels

16.6.12 The Humber Estuary is macro tidal with a mean spring tidal range of 5.7m at Spurn increasing to 7.4m at Saltend then decreasing to 6.9 m at Hessle, which is 45km inland. Tides are semi diurnal with a slight diurnal inequality (one slightly higher high water followed by a slightly lower one), amounting to a 0.2 m difference in high water spring tides at Immingham. Standard tidal levels at Immingham are provided in **Table 16.3**.

Table 16.3: Standard tide levels for Immingham

Tidal Level		Immingham	
		mCD	mODN
Highest Astronomical Tide	HAT	8.00	4.10
Mean High Water Springs	MHWS	7.30	3.40
Mean High Water Neaps	MHWN	5.80	1.90
Mean Sea Level	MSL	4.18	0.28
Mean Low Water Neaps	MLWN	2.60	-1.30
Mean Low Water Springs	MLWS	0.90	-3.00
Lowest Astronomical Tide	LAT	0.10	-3.80
Mean Spring Tidal Range	(MHWS – MLWS)	6.40 m	
Mean Neap Tidal Range	(MHWN – MLWN)	3.20 m	
Note: Conversion from mCD to mODN at Immingham = -3.90 m.			

Source: UKHO 2022 (Ref 16-16)

16.6.13 The Humber tides are driven by the amphidromic system centred off the west coast of Denmark in the central North Sea. As the tide passes south of North Shields, it enters shallow water conditions which amplify the tidal range. This amplified tidal range drives the Humber tidal system so that the macro tidal range within the estuary is a product of the general morphology of the east coast as well as of the estuary itself.

Extreme water levels

16.6.14 Current extreme predictions determined by the Environment Agency for Immingham are the most up-to-date and appropriate for this review (Ref 16-17). These are provided in **Table 16.4** for a baseline year of 2017.

Table 16.4: Predicted extreme water levels for the Port of Immingham (Ref 16-17)

Return Period (Years)	Annual Exceedance Probability (%)	Extreme Water Level (mODN)
1	100	4.15
2	50	4.25
5	20	4.40
10	10	4.51

Return Period (Years)	Annual Exceedance Probability (%)	Extreme Water Level (mODN)
20	5	4.62
25	4	4.66
50	2	4.77
75	1.3	4.85
100	1	4.90
150	0.67	4.97
200	0.5	5.03
250	0.4	5.06
300	0.33	5.10
500	0.2	5.20
1,000	0.1	5.34
10,000	0.01	5.85

16.6.15 The maximum water level currently recorded at Immingham occurred on 5 December 2013 at 19:00 hours with a level of 5.22m Ordnance Datum Newlyn (ODN) compared to the predicted 3.69m ODN; therefore, the meteorological surge effect during the recorded event was 1.53m.

Sea level rise

16.6.16 The above data do not allow for sea level rise in the future. In order to take into account future sea level rises, and given an assumed engineering design standard of 50 years from 2023, the latest UKCP18 (Ref 16-21) relative sea level research and assuming a Representative Concentration Pathway (RCP) 8.5 (95%ile) scenario will add 0.52 m to the water levels provided in **Table 16.4**.

Flows

16.6.17 Flow speed data has been obtained from the United Kingdom Hydrographic Office (UKHO) Admiralty Tidal Diamond, located within the main channel, approximately 2km up-estuary of the Project. The variation in the tidal flow conditions is provided in **Table 16.5**. Bespoke, site-specific hydrodynamic information is presently being collected and will be used to provide a more detailed description of the tidal flow conditions within the ES.

Table 16.5: Tidal flow conditions from the closest Admiralty Tidal Diamond (Ref 16-16)

Time (hours)	Direction (going to °N)	Spring rate (m/s)	Neap rate (m/s)
-6	132	1.30	0.41
-5	239	0.10	0.10
-4	303	1.10	0.57
-3	305	1.70	0.87
-2	314	1.60	0.87
-1	315	1.50	0.57
HW	319	0.67	0.15
1	122	0.67	0.36
2	133	1.70	0.72
3	129	2.10	1.20
4	132	2.30	1.40
5	126	1.80	1.30
6	132	1.50	0.82

16.6.18 The predicted flow data reveals that the flow regime fronting Immingham is generally rectilinear, with flows aligned approximately east-southeast on the ebb to west-northwest on the flood. Peak flows of around 2.1 m/s are predicted during the ebb tide, with notably slower flows on the flood phase of the tide, resulting from the relative effects of the shallow 'shelf' of Stallingborough Flats and the drag effects from IOT.

Waves

16.6.19 From available data, the wave climate across the Project site is generally protected from large waves approaching from the North Sea by a combination of sheltering effects (from Spurn Head and the various banks and channels within the outer parts of the Humber Estuary).

16.6.20 Measured data from the Project oceanographic survey campaign is being collected and will be used to provide a more detailed description of the local wave climate within the ES.

Geology and sediments

16.6.21 The underlying solid geology of the Humber is Upper Cretaceous Chalk. Locally there are two formations: Flamborough Chalk and Burnham Chalk. The younger Flamborough Chalk has identifiable bedding surfaces, distinct marl bands and is without flint. The underlying Burnham Chalk, which subcrops along the eastern part of the site, is thinly bedded and laminated and contains continuous flint bands. The Port of Immingham is located at a point where the Burnham Chalk Formation is not covered by the Flamborough Chalk Formation (Ref 16-18).

16.6.22 The chalk surface is characterised by a highly fractured zone created by glacial and periglacial processes, and overlain by Pleistocene deposits of Glacial Till. These glacial and post-glacial sequences are subsequently overlain by fine-grained (Clay and Silt) Tidal Flat Deposits.

16.6.23 The Humber lies in a complex of solid and superficial geology which can be simplified into three groups: the pre-Quaternary, the glacial (or Quaternary) and Post Glacial (or Holocene).

16.6.24 The estuary upstream of the Humber Bridge represents an older estuary system formed in the last interglacial (120,000 to 80,000 years Before Present) with the estuary mouth at this time being located near the current Humber Bridge. Downstream of this point, the estuary is more recent in geological terms, the channel having formed in immediate post glacial times as melt water cut down through glacial till deposits. During the post glacial period of Sea Level Rise (SLR), the former river channel underwent marine transgression and became subject to estuarine sedimentation.

16.6.25 The sediment budget of the Humber Estuary has previously been informed, by historic analysis of data between 1946 and 2000 (comprising approximately three complete nodal tidal cycles) (Ref 16-19). It is noted that there is a high degree of variability in the underlying data, so regression coefficients calculated during the analysis are poor (although the relationships are statistically significantly different from 'no trend'). The three main sediment sources for the Humber Estuary are its tributaries, the North Sea (in the form of background suspended sediment) and the eroding Holderness coast. The exchange between the rivers and the sea is an order of magnitude smaller than the flux of sediment through the mouth on each tide and the inputs and outputs on each tide are very much smaller than the volume of sediment held in suspension and continually moving within the Estuary. A summary of the sediment budget is provided in **Table 16.6**.

Table 16.6: Net sediment budget model for the Humber Estuary (Ref 16-19) (based on analysis of data between 1946 and 2000)

System Element	Sediment load and rate of exchange with the Estuary (+ve indicates an input; -ve indicates a removal) (tonnes per tide)
Humber Estuary	1.2×10^6 tonnes

System Element	Sediment load and rate of exchange with the Estuary (+ve indicates an input; -ve indicates a removal) (tonnes per tide)
River inputs	+335
Intertidal accretion	-4
Subtidal erosion	+145
Cliff erosion	+7
Saltmarsh deposition	-11
Met marine exchange	-472
Average tidal flux	$\pm 1.2 \times 10^5$

16.6.26 The bed sediments within the vicinity of the study area are understood to be a mixture of muds and sands. Previous sampling in the Immingham area has also identified the potential for chalk outcrops at depth. The benthic sampling, undertaken during July 2022 as part of the Project study, collected eight sediment samples within, and adjacent to, the proposed berth dredge (see **Figure 16.3** (PEI Report, Volume III) for locations). The bed samples were subsequently analysed for PSD, in order to characterise the bed material across the site. The majority (five of the eight samples) are classified as sandy Mud (Ref 16-20), with the remainder comprising Mud (see **Figure 16.3** (PEI Report, Volume III) for the PSD of the site and **Table 16.7** for summary PSD information). Previous sampling has also collected grab samples across the two disposal sites (HU56 and HU60). PSD information for these samples (see **Figure 16.3** (PEI Report, Volume III) for locations) are also provided in **Table 16.7**, revealing a mixture of sediment type, with varying proportions of sand, mud and gravel.

16.6.27 Across the eight sediment samples collected as part of the baseline studies carried out for the Project, the average bed composition is 76% mud, 24% sand and no gravel material. Within the proposed dredge pocket, these average values shift slightly towards the coarser particles with 69% mud and 31% sand. As noted above, the majority of locations (all within the proposed dredge pocket) are categorised as ‘sandy Mud’ (Ref 16-20), with locations 1, 2 and 3 (inshore of the dredge pocket) defined as ‘Mud’.

16.6.28 Measurements of SSC previously collected from the Immingham area, show that during ebb tides peak SSC can vary from a few hundred mg/l to over 1,000mg/l, during larger spring tides. The SSC levels are also generally higher on spring tides (approximately double the concentrations observed on neap tides) and during the winter months, compared to summer months. The Project oceanographic survey will collect information on suspended sediments, which will be used to detail the local characteristics withing the ES.

Table 16.7: Particle size distribution across the Project and disposal sites

Sample	Percentage composition (%)			Sediment description*	Mean grain size (d50) (µm)
	Mud	Sand	Gravel		
1	96.69	3.31	0.0	Mud	7.8
2	94.11	5.89	0.0	Mud	8.2
3	96.32	3.68	0.0	Mud	7.0
4	71.10	28.90	0.0	Sandy Mud	20.1
5	57.35	42.65	0.0	Sandy Mud	27.7
6	63.76	36.24	0.0	Sandy Mud	23.6
7	71.51	28.49	0.0	Sandy Mud	17.9
8	55.43	44.57	0.0	Sandy Mud	30.6
HU56_01	0.0	100.0	0.0	Sand	159.0
HU56_02	1.6	84.0	14.4	Slightly Gravelly Muddy Sand	186.1
HU56_03	37.1	16.2	46.6	Muddy Gravel	83.8
HU56_04	16.3	12.1	71.5	Gravelly Mud	17.7
HU56_05	18.7	80.1	1.2	Gravelly Sand	707.9
HU56_06	35.0	17.0	48.0	Muddy Gravel	73.7
HU60_01	0.0	100.0	0.0	Sand	230.7
HU60_02	0.0	100.0	0.0	Sand	227.7
HU60_03	0.4	61.7	37.9	Slightly Gravelly Muddy Sand	148.1
HU60_04	0.0	100.0	0.0	Sand	232.7
HU60_05	0.0	100.0	0.0	Sand	202.1
HU60_06	0.0	100.0	0.0	Sand	223.6
* Sediment description after Ref 16-20					

16.6.29 In addition to the bed sampling described above, a full-spread geophysical survey is also planned across the Site. Once completed, these survey data will be used to update the general description of the sub-bottom geology, provided below.

16.6.30 Three seabed sediment classifications have been identified from existing, available Side Scan Sonar and Multibeam Echo Sounder data across the wider Immingham region: silt/mud, muddy sand, and firm clay. Silt/mud is the dominant sediment type. Muddy sand is present further to the north, in an area which also hosts mobile bedforms (geological features that develop at the interface between the seawater and mobile element of the seabed). Firm clay is present towards the south-east and presents as positive relief exposure at the seabed.

16.6.31 Four main types of sub-surface units have been identified, also with sub-units. The geological model has been informed by background site information and geotechnical work carried out previously at, or near to, the survey area. The uppermost unit is comprised of alluvium deposits that can be further subdivided into surficial sediments composed of soft silt/mud with a depth range between 0 to 3.0m below seabed (BSB).

16.6.32 The alluvium is composed of a mix of fluvial sediments comprised of sands, gravels, and clays. The unit presents a complex structure of channelisation and subsequent sediment fill. The base of the alluvium sediments (as a whole) range between 0.8m and 9.1m BSB.

16.6.33 A bright reflector was identified in the upper sub-surface of much of the survey site. This reflector has been interpreted as a layer of organic sediment due to severe acoustic attenuation of the seismic data and by reference to historical borehole logs. All subsequent horizon interpretations have been limited by the presence of the organic sediment layer that attenuates the underlying reflectors, making them uninterpretable across certain areas of the wider region.

16.6.34 A layer of boulder clay underlies the alluvium, which has been interpreted as the “upper boulder clay” unit. The upper boulder clay ranges between 0m and 20.0 m BSB. Beneath the boulder clay lies a horizon interpreted from geotechnical data as inter-glacial clays. This horizon ranges between 4.0m and 25.6m BSB. A second layer of boulder clay has been interpreted as the “lower boulder clay” unit and is intermittently interpreted between 8.7m and 37.5m BSB. The bedrock has been identified as chalk (from geotechnical data) and has been intermittently observed in the seismic data at depths between 15.4m and 41.5m BSB. The bedrock level appears to be dipping downwards towards the north-western edge of the study area.

Future Baseline

16.6.35 Hydrodynamic and sedimentary processes will continue to be influenced by natural and human-induced variability, ongoing cyclic patterns and trends (e.g., ongoing maintenance dredging and disposal) with or without the Project.

16.6.36 The future baseline would also be influenced by climate change and, in particular, increased rates of mean sea level rise. Projections of change for Immingham up to 2100 are 0.99m (based on UKCP18 RCP 8.5 95%ile climate change scenario). Water levels in the future, as now, would also be affected by unpredictable surge and weather-related events.

16.7 Design, Mitigation and Enhancement Measures

Embedded Mitigation Measures

16.7.1 The Project has been designed, as far as possible, to avoid and minimise impacts and effects on physical processes through the process of design development, and by embedding mitigation measures into the design, such as minimising the dredge requirements as far as possible.

Standard Mitigation Measures

16.7.2 Standard mitigation measures will be undertaken to manage commonly occurring environmental effects. Although these are not likely to alter the assessment conclusions, they are considered to be standard good practice and are taken account of in the initial impact assessment. In terms of physical processes, the following standard mitigation measure will likely be recommended:

a. **Even disposal deposition**: The targeting of disposal loads in the central/deeper areas of the disposal sites (HU056 and HU060) will be undertaken to reduce depth reductions. This will minimise the initial reduction in water depth and any environmental changes at these disposal sites.

16.8 Potential Impacts and Effects

16.8.1 This section identifies the potential likely effects on the physical processes receptors as a result of the construction and subsequent operation of Project (**Figure 16.4** in PEI Report, Volume III).

16.8.2 Cumulative impacts on physical processes that could arise as a result of other developments and activities in the Humber Estuary are considered as necessary as part of the cumulative impacts and in-combination effects assessment (**Chapter 25: Cumulative and In-Combination Effects**).

16.8.3 The preliminary assessment has identified potential likely impacts on physical processes as a result of the construction and subsequent operation of the Project.

16.8.4 These impacts are associated with:

a. Changes in SSC and sedimentation from the capital dredge and disposal and piling.

b. Changes in hydrodynamics and waves from the presence of marine facilities (approach jetty, jetty platform and dredge pocket).

c. Indirect impacts on existing features, including marine infrastructure, outfalls and estuary banks and channels as a result of changes in hydrodynamics, waves and associated sediment transport pathways.

d. Changes in SSC and sedimentation from maintenance dredging during operation.

Construction

16.8.5 This section contains an assessment of the potential impacts of the construction phase of the Project. It should be noted that the construction of the Project may be completed in a single stage, or it may be sequenced such that the construction of Berth 2 takes place at the same time as operation of Berth 1 (see **Chapter 2: The Project**). Numerical modelling is based on a scenario with all elements of infrastructure in place including both berths and is considered a 'worst-case' scenario in terms of potential impacts on hydrodynamics. Capital dredging (and associated disposal activity) will be undertaken together at one time, before operation of Berth 1 commences. Therefore, for all impact pathways the physical processes assessment will not be altered by a single or sequenced construction period.

16.8.6 At this preliminary stage the following construction activities and impacts have been identified and considered:

a. Capital dredge and disposal and piling works:
   i Increased SSC and potential sedimentation over the extent of the disturbance plume as a result of the construction of the new jetty(s) (piling) and capital dredging works.
   ii Increased SSC and potential sedimentation as a result of the deposit of capital dredge material at a licensed offshore disposal site(s).
   iii Changes in seabed bathymetry and composition as a result of deposition of dredged/disposal material within the area of the respective plumes.
b. Changes in local flow speeds (and potential impact on local sediment dynamics) as a result of construction vessel activity (ship wash, vessel propulsion etc.).

Capital dredge and disposal and piling - potential impact on SSC and sedimentation

16.8.7 The disposal of dredged material at sea associated with the Project would be fulfilled at licensed disposal sites HU056 (for any inerodible boulder/glacial clay) and HU060 (for any sand/silt (alluvium) material) (see **Chapter 2: The Project**).

16.8.8 The potential impact of dredge arisings (and spoil from removal to licensed disposal sites) on SSC and sedimentation has been assessed. However, the disposal activity is considered to result in a larger extent and magnitude of impact than that arising from the dredge (as a result of the relative volumes and methods). The approach uses the dredge volumes provided by the project engineers and expert knowledge of the likely dredging process and of the availability of open disposal sites. The assessment is informed by application of the calibrated numerical hydrodynamic modelling tool, which drives a Danish Hydraulic Institute (DHI) particle tracking module.

16.8.9 It is anticipated that most of the dredging for the berth pocket would be undertaken by a backhoe dredger and would be supported by split barges on a continuous cycle to the disposal grounds. This dredging method has been

assessed here as a worst-case for potential impact on SSC (resulting from release of material throughout the water column during both dredging and disposal – see assumptions in **Section 16.2**). The number of barges would be determined by the barge loading time and the time of transit to and from the disposal grounds so that the backhoe dredger is never stood idle, meaning the works would be a 24/7 operation until dredging is complete. The assessment is based on barge access to the disposal sites being achieved throughout the full tidal cycle (see **Paragraph 16.4.5**). Current dredge volume estimates (based on the latest available site-specific geotechnical and geophysical information) are for a total of approximately 100,000 m^3 of material.

Dredging of the proposed berth(s) and associated disposal at HU060

16.8.10 Based on previous experience, the following assumptions have been made in relation to the berth dredge:

a. Backhoe bucket size of 8 m^3;

b. Average bucket cycle time of 2 minutes;

c. Working capacity of barge = 950 m^3;

d. A continuous barge operation would provide maximum production and greatest potential for magnitude in plume; and

e. Typical rates, vessel speeds and distance to disposal site have been used to calculate typical dredge cycle times.

16.8.11 In addition, the following details have also been assumed in respect of the plume assessment, based on an understanding of the method and equipment to be used:

a. Distance from dredge to disposal site is approximately 1.1 nautical miles and the assumed load service speed is 8 knots;

b. Barge deposit time is 10 minutes;

c. Characteristic sediment distribution is informed by the bed sampling (detailed in **Table 16.7** to this chapter, with a mean grain diameter of around 20 µm;

d. Inputs to the plume modelling from the dredge are applied both at the bed and also uniformly through the water column, arising from bucket lowering, bed ripping, water column wash and slewing (breaking the water surface);

e. Inputs to the plume modelling from the deposit at the disposal site are applied both at the bed (from the deposit) and also just below the surface (from the initial release, based on the loaded draught of the barge); and

f. At the disposal site, the sediment predominantly falls to bed as a density current and is then available for onward advection through bed erosion processes.

16.8.12 Using the above assumptions, the model assesses the repeating cycle of (dredging at the planned berth pocket and subsequent) disposal at HU060. Consequently, the basis of the assessment assumes continuous dredging

(throughout the modelled period) at the proposed berth location(s) and a disposal (over a 10-minute period) at HU060 every four hours.

16.8.13 The deposits at HU060 have been assessed, as this site is likely to receive the vast majority of the more unconsolidated dredged material. If required, HU056 will be used for the disposal of any inerodible boulder clay, which is considered likely to remain on the bed, without resulting in a significant plume of material. As a consequence, disposal activities at HU056 have not been modelled as the impacts are considered to be well within the magnitude and extent of the envelope of impact defined by the assessment of material at the HU060 disposal site (included in this assessment).

Spatial dispersion of dredge plume and sedimentation

16.8.14 Following the repeating schematic dredge cycle the particle tracking model has been run with sequential dredge, disposal, dredge, cycles. The initial dredge commences during a mean spring tide and the cycle repeats for the remainder of the model run period. Dredge locations within the berth pocket are switched between either end of the berth pocket, whilst disposal inputs are to the centre of the HU060 disposal site.

16.8.15 **Figure 16.5** (PEI Report, Volume III) shows the maximum spatial extent of the disposal SSC plume at HU060 over peak flood and peak ebb tidal flows (on a spring tide). The maximum extent of excess SSC resulting from the assessed repeating 'dredge > disposal…' cycle is shown in **Figure 16.6** (PEI Report, Volume III).

16.8.16 For dredge arisings disposed at the HU060 site, it is anticipated that material will initially remain in suspension (when deposited during flood or ebb tidal flows), before settling to the bed during slack water around high water (HW) and low water (LW) periods. Once deposited to the bed, the material will return to the background sedimentary system for subsequent transport under flood or ebb tidal flows. Maximum SSC levels are associated with the disposal activities (with relatively small increases in SSC arising from the dredge itself). Peak excess SSC levels resulting from the disposal activities are around 600-800 mg/l at the spoil ground, reducing to typically 100-200 mg/l with distance from the source. Upstream of Hull, maximum SSC levels are lower; generally, between 20 and 100 mg/l, as the tidal excursion from the disposal site limits the extent of the resultant plume.

16.8.17 In practice, due to the high magnitude of (and wide envelope of variability in) background SSC levels, the predicted increase in concentrations resulting from the disposal activities is likely to become immeasurable (against background) within approximately 1 km of the disposal site. Furthermore, the effects of the proposed disposal operations are considered to be no different to those arising from the ongoing maintenance dredge/disposal activities that are carried out at the adjacent Immingham berths. The measurable plume from each disposal operation is only likely to persist for a single tidal cycle (less than 6 hours from disposal). After this time, the dispersion under the peak flood or ebb tidal flows means concentrations will have reverted to background levels. Increased

concentrations arising from the dredge operations are of lower magnitude and persist over a shorter distance (and time) than that from the disposal.

16.8.18 Associated sedimentation (**Figure 16.6** (PEI Report, Volume III)) to the bed extends up- and down-estuary from the disposal site. Peak sedimentation depths are around 4-6 mm within a distance of around 4 km from the disposal site. At the dredge location, increased sedimentation above 3 mm is predicted within around 500 m (aligned to the flow vectors) up- and down-stream of the dredged pocket. Outside of these areas, the majority of deposition levels across the study site are less than 1 mm. Once on the bed, the deposited material returns to the background system to be put back into suspension on subsequent peak flood or ebb tide to be further dispersed.

16.8.19 Example timeseries plots of predicted excess SSC and associated sedimentation (from the combined dredge/disposal operations) is provided in **Figure 16.7** (PEI Report, Volume III) for two locations – one just up-estuary and one just down-estuary of the HU060 disposal site. In each case, peak SSC and sedimentation values are predicted at the disposal site whilst, at locations approximately 1.5 km up- and down-estuary, the timeseries plots show the temporal nature of the excess material. Each disposal results in peak SSC of around 100-200 mg/l at the selected locations (approximately 1.5 km from the disposal source). Each peak in SSC generally persists for a single timestep before the tidal forcing transports the plume further up/down estuary on the prevailing flood/ebb tide, respectively. Due to the timing of successive disposal events, there is no evidence of cumulative increases in SSC (i.e. the impact from each disposal is dispersed sufficiently before the next disposal, such that there is no predicted positive trend in excess SSC with sequential disposal events).

16.8.20 Associated with this, each disposal operation results in sedimentation of around 1-2 mm at locations around 1.5 km from source. Once deposited, this material remains on the bed during slack water periods, before being put back into suspension on the subsequent flood or ebb tide. Thus, material is returned to the existing (baseline) sediment regime, retained within the wider Humber Estuary system following disposal at HU060.

16.8.21 It should be noted that the map plots in **Figure 16.5** and **Figure 16.6** (PEI Report, Volume III) do not show the instantaneous SSC and sedimentation levels at any given point in time, rather they show the maximum SSC and sedimentation value at any location during the complete model run time. As a result, the plots show the extent of overall effect from the dredge and the disposal within the estuary, without reference to how soon after commencement of operations they occur, nor how long these values persist at any given location. In contrast, the successive temporal plots provided in **Figure 16.8** (PEI Report, Volume III) show the instantaneous extent and magnitude of excess SSC (and associated sedimentation) following a number of consecutive disposal events.

Assessment of exposure to change

16.8.22 The greatest increase in SSC from the piling, dredging and disposal activities will occur during the barge depositing material at the licensed disposal site. Material within the passive plume will be dispersed throughout the water column as the

load drops to the bed, with the potential to be transported up- and down-estuary through the full tidal excursion (dependent on tidal state at the point of release). Initial SSC values within the dynamic plume will be very high but, given the very high natural levels within the estuary, excess levels are likely to be reduced to below natural storm disturbance conditions very quickly (and before the next disposal operation commences four hours later). This is typically the same scenario that occurs for the existing maintenance dredging of the local Immingham berths, which has been undertaken frequently (multiple times during the year) since the berths were first implemented.

16.8.23 At the disposal site, the effect of deposition of capital dredge arisings will be similar to that which already occurs as a result of ongoing maintenance dredging and disposal. 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. As is currently the practice, 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. Ongoing monitoring of depths within the disposal site (an activity already undertaken to assess bed level changes as a result of existing dredge disposal activities) will continue into the future. Consequently, the impact of the disposal from both capital and future maintenance dredging of the berth(s) will be monitored.

16.8.24 The local hydrodynamics, the existing (background) SSC levels within the wider Humber Estuary and the proposed dredge and disposal works have all been considered within this assessment. Overall, the increase in SSC and potential sedimentation in the marine environment is likely to be the same as that which already occurs from existing maintenance dredging in the area (which has been occurring for many years). Moreover, peak increases will remain within the envelope of natural variability in background SSC. As a result, the probability of occurrence is considered high although the magnitude of change is assessed as small, resulting in an overall **low** exposure to change.

Construction vessel activity – impacts on local hydrodynamics and sediment transport arising from ship wash and vessel propulsion

16.8.25 It is understood that the piling and decking for the approach jetty and piers are being constructed using land-based plant and equipment, and by quasi-stationary floating and jack-up barges. Consequently, the only vessels associated with the construction phase are the dredgers and barges for the capital works and slow-moving jack-ups that, once in position, effectively remain stationary whilst carrying out the works. The majority of the material will be removed with a backhoe dredger to a hopper (for subsequent disposal). Whilst the optimal size of the dredging plant will need to be determined by the specialist dredging contractor, the backhoe method effectively uses stationary plant to dredge a defined area, with the plant moving across the dredge site until all the required material has been removed. In this way, the construction vessel movements are generally limited in frequency to the movements across the dredge area, rather than being continuous throughout dredge operations. Due to water depths across

the wider area, it is further considered likely that dredging plant will access the berth pocket from offshore, meaning that any ship wash and vessel propulsion effects on local flow speeds are anticipated to occur away from the adjacent foreshore.

16.8.26 Some material may also be removed by trailer suction hopper dredger (TSHD) depending on the sediment conditions and the availability of TSHD dredgers. Should this be the case, then deeper water depths will be required for the vessel to operate in. As described above, this will lead to potential ship wash and vessel propulsion impacts (to local flow speeds) being limited in extent to the deeper offshore areas on the estuary-side of the berth(s).

Assessment of exposure to change

16.8.27 There is predicted to be a generally limited temporal impact from the construction vessel movements (with infrequent movements across the berth pocket), coupled with the likely extent of effect being limited to the deeper, offshore side of the Site. As a result, it is unlikely that there would be any notable impact on local flows across the adjacent intertidal area and, by association, no likely impact on local accretion or erosion processes. Consequently, the probability of occurrence is considered medium although the magnitude of change is assessed as small, resulting in an overall **low/negligible** exposure to change.

Operation

16.8.28 This section contains an assessment of the potential impacts as a result of the operational phase of the Project. The following operational elements and impacts will be assessed:

a. Marine facilities (approach jetty and dredge pocket):
   - i Local changes to hydrodynamic regime (flow speed and direction) as a result of the piers (piling) and the implementation of the new berth pocket.
   - ii Associated local changes to the sediment transport pathways, as a result of localised changes to the driving hydrodynamic (and wave) forcing.
   - iii Local changes to the wave regime, as a result of the piers (piling) and the implementation of the new berth pocket.
   - iv Potential impacts on existing features, including existing marine infrastructure, outfalls and estuary banks and channels.

b. Maintenance dredging - potential impact on SSC and sedimentation:
   - i Increased SSC and potential sedimentation in the area of dispersal plume as a result of maintenance dredging.
   - ii Increased SSC and potential sedimentation as a result of deposition of maintenance dredge material at a licensed disposal site.
   - iii Changes in seabed bathymetry and composition as a result of deposition of dredged/disposed maintenance dredge material.

16.8.29 The pathways of change as a result of the operational phase of the Project, including changes to flow regime with a vessel at the berth(s), and changes to the sediment transport regime to determine potential effects on sedimentation rates (and hence the potential for maintenance dredging) are currently being assessed and will be reported within the ES.

Marine facilities (approach jetty, jetty platform and dredge pocket) - potential impact on hydrodynamics

16.8.30 A preliminary assessment of impacts on hydrodynamics has been carried out using numerical modelling tools and conceptual analysis (see **Paragraph 16.1.7**). The modelling has been completed using an updated version of the existing calibrated and validated MIKE FM HD model of the Humber Estuary. The updated model mesh has been refined around the study area and adjacent coastline.

16.8.31 The bathymetric datasets used in the creation of the model mesh consist of a combination of survey data collected for the Project, existing data provided by the Applicant in and around Immingham, along with topographic LiDAR data from the Environment Agency Open Data portal.

16.8.32 The updated model has been subject to new calibration and validation using survey data for the local area. Calibration and validation have been undertaken over a spring and neap tide. Full details of the model setup, calibration and validation are provided in **Appendix 16.A** (PEI Report, Volume IV).

16.8.33 Although not specifically shown on a figure within this assessment, it should be noted that the assessment of the Project on local hydrodynamics reveals no impact on water levels across the near- or far-field area. Consequently, water levels across the existing berths are not predicted to change as a result of the Project.

16.8.34 The predicted impacts on the local flow regime, obtained through hydrodynamic modelling of the area, are summarised both spatially, in the immediate vicinity of the approach jetty, jetty platform and dredge pocket, and temporally at a series of point locations identified as strategic locations and areas of greatest importance.

16.8.35 The spatial hydrodynamic effects of the marine facilities (approach jetty, jetty platform and berth pocket) are shown in **Figure 16.9** (PEI Report, Volume III) for the approximate time of peak flood and ebb spring flows. Initial results of the hydrodynamic modelling show that the Project causes generally small impacts, confined predominantly to the vicinity of the structure and adjacent Immingham Oil Terminal (IOT).

16.8.36 During the flood tide (**Figure 16.9** (PEI Report, Volume III)), the extent of effect as a result of the Project is approximately 3.5 km up estuary from the west edge of the berth pocket, across IOT and Humber International Terminal (HIT). Along IOT, flow speeds are reduced by up to 0.34 m/s on the eastern end of the jetty, and by 0.18 m/s at the western end. By the time flows reach HIT, the flow speed reductions are approximately 0.08 m/s. At the western edge of the berth pocket, flows are reduced by up to 0.48 m/s, this quickly reduces to a lowering of 0.2 m/s at the eastern end of the jetty platform. Small increases in flow speeds are seen

just to the north of the eastern end of the jetty platform, and to the south along the shore frontage of up to 0.08 m/s.

16.8.37 These changes in flow speed on the flood tide are relatively small with regards to the baseline flow speeds. Baseline flows are between 1.2 and 1.3 m/s in the area of interest. As a result, maximum predicted changes in flow speed as a result of the Project generally tend to be limited in extent to the dredge pocket itself and are around -30% of baseline flow speeds. Further afield, changes remain constrained to the area adjacent to the berth(s), with flow speed changes generally around -5%.

16.8.38 On the ebb tide (**Figure 16.9** (PEI Report, Volume III)), the assessment shows a similar pattern of change to the flood tide, however, the reduction in flow speed occurs for approximately 3km down estuary from the eastern end of the jetty platform. Here, there are flow speed reductions of up to 0.55m/s. However, this quickly reduces to a 0.25 and 0.1m/s reduction 500 m and 1 km downstream, respectively. In the berth pocket itself, flow speeds are reduced by up to 0.3m/s. South of the Project, flow speeds are slightly increased by less than 0.1m/s moving towards the shoreline.

16.8.39 As with the flood tide, these changes in flows speed are relatively small in relation to the baseline flows speeds. Baseline flows vary from approximately 1.6m/s to approximately 1.7m/s in the area of interest. As a result, predicted reductions in ebb flow speed within the dredge pocket generally tend to be around -18% of baseline flow speeds. To the east of the jetty platform, flow speeds reduce by up to 30% of the baseline, reducing to -5% 1km downstream of the Project.

16.8.40 Timeseries plots have been provided to illustrate a predicted temporal change throughout the spring tide at key locations. These are provided in **Figure 16.10** to **Figure 16.12** (PEI Report, Volume III).

16.8.41 At P1 (**Figure 16.10** (PEI Report, Volume III)), approximately 3km downstream of the project, changes in flow speeds on the flood tide would be negligible, and on the ebb tide, flow speeds would be reduced by approximately 0.05m/s.

16.8.42 At P2 and P3 (**Figure 16.10** (PEI Report, Volume III)), within 500m of the eastern end of the jetty platform, changes in flow speed on the flood tide would again be negligible. On the ebb tide, flow speeds at P2 are reduced by up to 0.3m/s, whilst at P3, flows are reduced by up to 0.5m/s.

16.8.43 Within the dredge pocket (locations P4 and P5), a general decrease in flow speeds is predicted (**Figure 16.10** and **Figure 16.11** (PEI Report, Volume III)) on the flood tide at both locations, flow speeds are reduced by up to 0.3m/s. On the ebb tide, flows speeds at both locations are reduced by up to 0.15m/s.

16.8.44 At P7 and P8 (**Figure 16.11** (PEI Report, Volume III)), in front of Immingham Oil Terminal (IOT), and P9 (**Figure 16.11** (PEI Report, Volume III)) (500m northwest of IOT) flow speeds are reduced by up to 0.25m/s on the later stage of the flood tide. On the ebb tide, changes in flow speeds are negligible.

16.8.45 At P10 (**Figure 16.12** (PEI Report, Volume III)), approximately 3.5km upstream of the Project in front of the Humber International Terminal, flow speeds on the flood

tide are reduced by less than 0.05m/s, whilst changes in flow speed on the ebb tide are negligible.

16.8.46 At P6, P11 and P12 (**Figure 16.12** (PEI Report, Volume III)), south of the Project, just in front of the foreshore, flow speeds are slightly increased by up to 0.05m/s on both the flood and ebb tides, although changes in flow speeds on the ebb tide at P12 are negligible. At each of these locations, associated changes to bed shear stress are negligible in the context of the thresholds of motion for the typical bed material. Whilst modelling of the potential for changes to sediment transport pathways remains ongoing (with results to be provided in the ES), it is currently anticipated that any changes to sediment erosion and accretion along the adjacent foreshore will be negligible.

Inclusion of vessels on-berth

16.8.47 The assessment of changes to hydrodynamics, as a result of vessels on-berth, has not yet been completed and results will be included in the ES. However, given the distance offshore, the water depths within the berth(s), the proximity to the main deep-water channel and the adjacent operational IOT berth(s), it is anticipated that the inclusion of vessels on berth at the Project will result in similar impacts to those described above.

Assessment of exposure to change

16.8.48 Marginal changes to hydrodynamics (local flow speed) are likely to result from the Project within, and adjacent to, the proposed berth pocket. Slight changes in flow speed are predicted to extend up-estuary to Immingham Outer Harbour and IOT and down-estuary. The largest predicted magnitude of change is anticipated within the berth pocket itself and the eastern end of the jetty platform. The probability of occurrence is, therefore, considered high, although the magnitude of change is assessed as small, giving rise to an overall **low** exposure to change.

Marine facilities (approach jetty, jetty platform and dredge pocket) – potential impact on sediment transport

16.8.49 Changes to the local hydrodynamics, as a result of the Project (as described above) have the potential to affect local sediment transport (i.e., faster flows may increase bed erosion, and lower flows may encourage sedimentation).

16.8.50 To investigate the potential impact of the marine facilities on sediment transport, the movement of fine-grained material (as identified across the Project grab sampling survey) has been investigated using the MIKE Mud Transport (MT) module. The model is driven by the outputs of the hydrodynamic model described above and verified against local dredge records and SSC measurements. The model setup and validation are described in **Appendix 16.1** (PEI Report, Volume IV).

16.8.51 The modelling tool has been applied to model the existing baseline for the Project, and the difference in bed thickness over a 15-day mean spring-neap cycle has been calculated.

16.8.52 **Figure 16.13** (PEI Report, Volume III) shows the predicted change in bed thickness of fine material, as a result of the Project, over a mean spring-neap tidal cycle. It is predicted that the changes in accretion and erosion patterns are generally small in both magnitude and extent. The reduction in flow speeds within the dredged berth pocket and across the leeward side slopes result in associated change to bed shear stress (BSS), allowing for slightly reduced erosion over the baseline condition. This indicates that the berth pocket, once dredged, will likely keep swept clear of deposited material by the flood and ebb tidal flows (in much the same way the existing IOT berths are). Consequently, the need for future maintenance dredging within the new berth pocket is expected to be limited.

16.8.53 In addition to the predicted reduced erosion within parts of the proposed berth pocket, local increases in peak flood and ebb current speed at the landward end of the proposed IGET approach jetty (**Figure 16.13** (PEI Report, Volume III)), result in associated slight increases to BSS. These lead to a slight increase in predicted erosion of the bed at the at the elevation of MLWS, beneath the landward end of the proposed jetty (**Figure 16.13** (PEI Report, Volume III)) shows the difference in bed thickness change against the baseline, with negative values indicating areas of either increased erosion or of reduced accretion). Over a mean spring neap cycle, the predicted erosion is less than 0.05 m, resulting in a potential indirect loss in intertidal area of approximately 0.01 ha. The assessment indicates that once this part of 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).

16.8.54 Across the wider study area (including the existing berths at IOT, the rest of the intertidal area along the Immingham frontage, the Habrough Marsh Drain and Immingham Sea outfalls, the offshore banks and channels and the wider estuary up- and down-stream), the Project marine facilities have no impact on the existing (baseline) accretion and erosion rates (**Figure 16.13** (PEI Report, Volume III)). Overall, there is predicted to be limited magnitude and extent of predicted change, resulting from the Project (in terms of both hydrodynamics across the range of tidal states and the associated negligible impact on estuary tidal prism and far-field sediment transport pathways). This, coupled with the in-estuary disposal of capital and maintenance dredge material (thus maintaining the sediment as part of the wider estuary sediment budget), indicates that the Project will not result in long-term changes to the wider estuary morphology.

Assessment of exposure to change

16.8.55 Hydrodynamic forcing within (and adjacent to) the Project will only be marginally altered and, therefore, changes in the sediment pathways will be small. Predicted changes to future sediment transport are small in magnitude and limited in extent to the berth pocket and the landward end of the approach jetty. Outside the proposed berth pocket, the Project has limited impact on the baseline sedimentation and erosion rates.

16.8.56 As a result, the probability of occurrence is considered to be high, and the magnitude of change is assessed as small, resulting in an overall **low** exposure to change.

Marine facilities (approach jetty, jetty platform and dredge pocket) - potential impact on waves)

16.8.57 Preliminary impacts on waves have been assessed using numerical modelling tools and conceptual analysis. The modelling has been completed using the existing (updated, as described) calibrated and validated MIKE SW model of the Humber Estuary. The model examines how wave conditions will be affected during extreme and more frequently occurring events.

16.8.58 The model utilises the same bathymetric data as the hydrodynamic model (as described above).

16.8.59 The updated model has been subject to performance checks by simulating wave conditions at the site, over a short period during which waves have been recorded at the site during the Project AWAC deployment (for discrete periods between 2020 and 2022). Full details of the model setup and verification are provided in **Appendix 16.A** (PEI Report, Volume IV).

16.8.60 The assessment of potential wave impacts from the Project has defined a set of wave conditions (including Hs, peak wave period (Tp) and wind speed (WS)), for a range of return periods and for a number of approach directions (described further in **Appendix 16.A** (PEI Report, Volume IV)). These wave events have then been applied to the numerical model under existing (baseline) and scheme scenarios. The predicted differences in modelled wave heights, as a result of the berth pocket dredge, have then be calculated.

Table 16.8: Extreme boundary wave conditions for the Humber Spectral Wave Model

Return period (yr)		North-easterly	Easterly	South-easterly
		All Year	All Year	All Year
0.5	Hs (m)	3.4	2.4	2.4
	Tp (s)	9.0	6.7	5.6
	WS (m/s)	15.0	13.0	15.0
50	Hs (m)	5.2	4.1	4.8
	Tp (s)	11.1	8.7	7.9
	WS (m/s)	23.0	21.0	25.0

16.8.61 The spatial wave effects of the construction of the Project are shown in **Figure 16.14** (PEI Report, Volume III) for each of the events modelled in **Table 16.8**. Preliminary results of the wave modelling show that the Project

results in generally small impacts, confined predominantly to the area in the vicinity of the structure.

16.8.62 The greatest effect on wave height for the 0.5-yr, north easterly event is seen at either end of the jetty platform, with reductions in wave height of up to 0.16m at the western end, and 0.14m at the eastern end (**Figure 16.14** (PEI Report, Volume III)). This reduction in wave heights continues south of the jetty platform, towards the foreshore. However, these reductions are small, with a 0.1m reduction immediately south of the jetty platform, reducing to 0.05m a further 500m south of the platform. At the foreshore, wave height reductions are negligible. There is no change to wave heights within the berth pocket. Baseline wave heights for this event tend to be in the region of 1.1 m around the Project. The maximum predicted change in wave height is therefore around -12%. This change is limited in extent to the area immediately around the jetty platform.

16.8.63 For the 0.5-yr, easterly and south easterly event, it is anticipated that the impacts will extend slightly further than those of the north easterly event (**Figure 16.14** (PEI Report, Volume III)). As with the north easterly event, the biggest impact is seen at the eastern and western ends of the jetty platform, with decreases in wave heights of up to 0.2m. The sheltering effect of the Project extends further west, across the IOT and towards Bellmouth. At this point however, wave speed reductions are small. By the time it has reached the most eastern part of IOT, wave heights are reduced by less than 0.05m. Within the berth pocket, wave heights are reduced by less than 0.08m. The baseline wave heights for this event are approximately 1.17 m, with a maximum decrease of 0.2m, which represents a change of around -17 % at the jetty platform. Reductions in wave heights elsewhere represent a change of around -6%.

16.8.64 As with the 0.5-yr event, the greatest effect on wave height for the 50-yr, north easterly event is seen at either end of the jetty platform, with reductions in wave height of up to 0.2m at the western end (10% decrease from the baseline), and 0.18m at the eastern end (9% decrease from the baseline) (**Figure 16.14** (PEI Report, Volume III)). This reduction in wave heights continues south of the jetty platform, towards the foreshore. However, these reductions are small, with a 0.1m reduction (5% relative to the baseline) immediately south of the jetty platform, reducing to 0.08m (4%) a further 500m south of the platform. Towards the foreshore, wave height reductions are less the 0.03m (1.5%). There is no change to wave heights within the berth pocket.

16.8.65 For the 50-yr, easterly event, it is anticipated that the impacts will extend slightly further than those of the north easterly event (**Figure 16.14** (PEI Report, Volume III)). As with the north easterly event, the biggest impact is seen at the eastern and western ends of the jetty platform, with decreases in wave heights of up to 0.3 m at the western end (13% reduction from the baseline), and 0.2m at the eastern end (9% reduction from the baseline). The sheltering effect of the Project extends further west, across the IOT and towards Bellmouth. At this point, however, wave height reductions are small. Along the most eastern part of IOT, wave heights are reduced by less than 0.05m (2%). Within the berth pocket, wave heights are reduced by less than 0.08m (3.5%).

16.8.66 The 50-yr south easterly event is similar in pattern and magnitude of effects on wave height as the easterly event, particularly along the jetty platform. However, due to the higher baseline wave heights for this event, the relative (percentage) decrease in wave height is less than that for the easterly event. At the jetty platform, wave heights are expected to decrease by up to 10%, whilst at IOT and towards the adjacent foreshore, wave heights are expected to decrease by less than 1% compared to the baseline.

Assessment of exposure to change

16.8.67 Marginal changes to significant wave height (Hs) are likely to result from the Project within, and adjacent to, the proposed berth pocket. For the various wave events assessed, slight changes in wave height (typically less than -6% of baseline values) are predicted to extend up-estuary as far as Bellmouth (for a wave event approaching from the southeast). The largest predicted magnitude of change is anticipated in the immediate vicinity of the jetty platforms.

16.8.68 The probability of occurrence is considered high, although the magnitude of change is assessed as small giving rise to an overall **low** exposure to change at this preliminary stage of the assessment.

Marine facilities (approach jetty, jetty platforms and dredge pocket) - potential impact on existing features, including marine infrastructure, outfalls and estuary banks and channels

16.8.69 Identified changes to the existing (baseline) hydrodynamics, waves and associated sediment transport pathways have the potential to impact existing features. Such features, which include existing marine infrastructure, land drainage outfalls and estuary banks and channels, have been identified in the relevant sections above and the potential impact from the Project is summarised here.

16.8.70 Changes to flows and waves are predicted to be generally limited in extent to around the Project marine facilities and in the immediate vicinity. The predicted impacts at the existing marine terminals (including IOT, Humber Sea Terminal, Immingham Eastern and Western Jetties, Immingham Outer Harbour and Immingham Gas Terminal) are (where predicted) generally small in magnitude. This is also the case for the adjacent foreshore areas fronting the project site, which include a number of outfalls. With distance from the Project, the predicted impacts reduce further and are not predicted to occur over the far-field region. Changes to local and regional sediment transport pathways have been modelled and are only predicted in close proximity to the marine elements of the Project, meaning the existing banks and channels of the wider Humber estuary are not predicted to be impacted by the development.

Assessment of exposure to change

16.8.71 Changes to flows and waves are likely to result from the Project marine facilities within, and adjacent to, the proposed berth pocket and jetty infrastructure. These changes are predicted to be greatest in closest proximity to the Project, reducing in magnitude with distance. Associated impacts to sediment transport pathways

are currently being assessed and will be included in the ES. However, given the small extent and low magnitude of effect on the driving hydrodynamics, coupled with the relatively stable nature of the estuary morphology across the near-field study area, it is presently considered that the predicted changes arising from the Project will not affect the existing, longer-term cyclic patterns in the estuary banks and channels.

16.8.72 Across the near-field, the probability of occurrence is considered high, although the magnitude of change is assessed as small giving rise to an overall **low** exposure to change. Across the far-field, the probability of occurrence is considered low, and the magnitude of change is assessed as negligible, giving rise to an overall **negligible** exposure to change.

Maintenance dredging - potential impact on SSC and sedimentation

16.8.73 The assessment of impacts on local and regional sediment transport pathways is currently underway and the findings will inform the potential requirement for future maintenance dredging. Once the modelling is complete, this assessment will be undertaken and included in the ES. However, it is considered that any maintenance dredging (if required) will be of a considerably smaller volume than that assessed above for the capital works. In fact, the adjacent berths at IOT currently require minimal maintenance dredging as the berths are kept clear of accreted material by the flows through the main deep-water channel.

16.8.74 Outside of the berth(s), and particularly within the existing Immingham berths, the predicted changes to flow speed and wave height are generally negligible. Whilst the detailed assessment of changes to sediment transport is underway and will infirm the assessment within the ES, it is currently considered unlikely that the proposed works for the Project would have any noticeable impact on existing maintenance dredge requirements along the remainder of the Immingham frontage. This is particularly true considering the range of natural variability in the annual maintenance requirements within the existing berths.

Assessment of exposure to change

16.8.75 This assessment will be updated within the ES, following completion of the sediment transport modelling. At this stage (as a result of the predicted changes to the driving hydrodynamics and the existing nature of sedimentation and dredging requirements in adjacent (existing) berths), it is considered that any future maintenance dredging (if required) will result in smaller changes in SSC and sedimentation compared to the capital dredge. Furthermore, the predicted impacts from future maintenance dredging (if required) will be similar to that which already arises from the ongoing maintenance of the existing Immingham berths. As a result, the probability of occurrence is presently considered medium although the magnitude of change is assessed as small, resulting in an overall **low/negligible** exposure to change.

16.9 Preliminary Assessment of Residual Effects

Construction

16.9.1 None of the impact pathways identified for physical processes are expected to give rise to a measurable exposure to change. All potential impacts during construction, at this preliminary stage, and based on the current project design, have been assessed as **not significant**.

Operation

16.9.2 All potential impacts on impact pathways identified for physical processes during operation, at this preliminary stage, and based on the current project design, have been assessed as **not significant**.

Decommissioning

16.9.3 The DCO will not make any provision for the decommissioning of the marine infrastructure above and below water level. This is because the Project would, once constructed, become part of the fabric of the Immingham port estate and would, in simple terms, continue to be maintained so that it can be used for port related activities to meet a long-term need. On this basis, potential effects on physical processes from decommissioning have been scoped out.

16.9.4 The final outcomes of the likely significant effects of the Project on physical processes will be reported within the ES.

16.10 Summary of Preliminary Assessment

16.10.1 A summary of the impact pathways that have been assessed, the identified residual impacts and level of confidence are presented in **Table 16.9** to this chapter based on the current understanding. These will be updated in the ES, following completion of the outstanding modelling. This assessment has focussed on the potential 'exposure to change' resulting from the impact pathways that have been scoped into the assessment.

16.10.2 Overall, the physical processes changes brought about by the construction and operation of the Project are currently considered small in both magnitude and extent and the resultant exposure to change assessed as low.

Table 16.9: Summary of potential impact, mitigation measures and residual effects

Receptor	Impact Pathway	Exposure to change	Mitigation Measure	Residual Effect	Confidence
Construction Phase					
Physical processes	Increased SSC and potential sedimentation over the extent of the disturbance plume as a result of the construction of the new piers (piling) and capital dredging works	Low	N/A	Low	Medium
	Increased SSC and potential sedimentation as a result of the deposit of capital dredge material at a licensed offshore disposal site	Low	N/A	Low	Medium
	Changes in seabed bathymetry and composition as a result of deposition of dredged/disposal material within the area of the respective plumes	Low	N/A	Low	Medium
	Construction vessel activity – impacts on local hydrodynamics and sediment transport arising from ship wash and vessel propulsion	Low/negligible	N/A	Low/negligible	Medium
Operational Phase					
Physical processes	Local changes to hydrodynamic regime (flow speed and direction) as a result of the piers (piling) and capital dredging	Low	N/A	Low	Medium
	Local changes to the wave regime, as a result of the piers (piling) and capital dredging	Low	N/A	Low	Medium

Receptor	Impact Pathway	Exposure to change	Mitigation Measure	Residual Effect	Confidence
	Associated local changes to the sediment transport pathways, as a result of localised changes to the driving hydrodynamic (and wave) forcing	Low	N/A	Low	Medium
	Potential impact on existing features, including marine infrastructure, outfalls and estuary banks and channels	Hydrodynamics: Low Sediment transport: Low	 N/A N/A	 Low Low	 Medium Medium
	Increased SSC and potential sedimentation in the area of dispersal plume as a result of maintenance dredging	Low	N/A	Low	Medium
	Increased SSC and potential sedimentation as a result of deposition of maintenance dredge material at a licensed disposal site	Low	N/A	Low	Medium
	Changes in seabed bathymetry and composition as a result of deposition of dredged/disposed maintenance dredge material	Low	N/A	Low	Medium

16.11 References

Ref 16-1 European Commission (2000). Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

Ref 16-2 The Stationery Office Limited (2009). Marine and Coastal Access Act 2009.

Ref 16-3 The Stationery Office Limited (2008). Planning Act 2008.

Ref 16-4 The Stationery Office (2017a). Statutory Instrument 2017 No. 407. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.

Ref 16-5 The Stationery Office (2017b). Statutory Instrument 2017. No. 1012. The Conservation of Habitats and Species Regulations 2017.

Ref 16-6 The Stationery Office Limited (2019) The Floods and Water (Amendment etc.) (EU Exit) Regulations.

Ref 16-7 The Stationery Office Limited (2019). Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019.

Ref 16-8 The Stationery Office Limited (2011). Statutory Instrument 2011. No. 988. The Waste (England and Wales) Regulations 2011.

Ref 16-9 Department for Transport (2012). The National Planning Policy Statement for Ports. HMSO, London.

Ref 16-10 The Stationery Office Limited (2011). UK Marine Policy Statement.

Ref 16-11 Department for Environment, Food and Rural Affairs (Defra) (2019). UK Marine Strategy.

Ref 16-12 HM Government (2014). East Inshore and East Offshore Marine Plans.

Ref 16-13 Environment Agency (2010). SMP3: Flamborough Head to Gibraltar Point Shoreline Management Plan.

Ref 16-14 North East Lincolnshire Council (2018). North East Lincolnshire Local Plan.

Ref 16-15 Planning Inspectorate (2017). Advice Note Eighteen: The Water Framework Directive. Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-18/ (accessed November 2022).

Ref 16-16 UK Hydrographic Office (2022) Admiralty Tide Tables.

Ref 16-17 Environment Agency. (2018). Coastal flood boundary conditions for the UK: update 2018. Technical summary report. SC060064/TR6

Ref 16-18 British Geological Society (BGS) (2022). Geology Viewer. Available at: https://geologyviewer.bgs.ac.uk/?_ga=2.61621935.2025046977.1668593830-1031070941.1668593830 (accessed 16 November 2022).

Ref 16-19 ABPmer. (2004). Humber SMP2: Additional verification of morphological modelling, ABPmer Report No. R.1138. A report produced by ABPmer for Black & Veatch (on behalf of the Environment Agency), September 2004.

Ref 16-20 Folk, R.L. (1954). The Distinction between Grain Size and Mineral Composition in Sedimentary-Rock Nomenclature. Journal of Geology, 62, 344-359.

Ref 16-21 Palmer, M., Howard, T., Tinker, J., Lowe, J., Bricheno, L., Calvert, D., Edwards, T., Gregory, J., Harris, G., Krijnen, J., Pickering, M., Roberts C., Wolf J. (2018). UK Climate Projections Science Report: UKCP18 Marine report. Met Office Hadley Centre: Exeter.

16.12 Abbreviations and Glossary of Terms

Table 16.10: Glossary and Abbreviations

Term	Acronym	Meaning
Appropriate Assessment	AA	The assessment of the impact on the integrity of a European site of a project or plan, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives.
Associated British Ports	ABP	One of the UK's leading and best connected ports groups, owing and operating 21 ports across England, Wales and Scotland.
Acoustic Wave and Current	AWAC	The Acoustic Wave and Current profiler performs measurement of wave height, wave direction and the full current profile.
Best Practical Environmental Option	BPEO	The Best Practicable Environmental Option is the idea that there is a unique, supremely beneficial method of disposing waste in a cost effective manner, in both the short and long term.
Below Seabed	BSB	-
Chart Datum	CD	A chart datum is the water level surface serving as origin of depths displayed on a nautical chart.
Candidate Special Area of Conservation	cSAC	A site proposed for designation under EU legislation for the protection of habitats and species considered to be of European interest.
Conductivity-Temperature Depth	CTD	A CTD is an instrument cluster that measures conductivity, temperature and depth.
Department for Environment, Food and Rural Affairs	Defra	The Government department responsible for policy and regulations on environmental, food and rural issues. The department's priorities are to grow the rural economy, improve the environment and safeguard animal and plant health.
Department for Transport	DfT	The Department for Transport is the United Kingdom government department responsible for the English transport network.
Exclusive Economic Zone	EEZ	An area of coastal water and seabed within a certain distance from a country's coastline, to which the country claims exclusive rights for fishing drilling and other economic activities.

Term	Acronym	Meaning
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
European Union	EU	An economic and political union of 28 countries which operates an internal (or single) market which allows the free movement of goods, capital, services and people between member states.
Ground Investigation	GI	An intrusive investigation undertaken to collect information relating to the ground conditions, normally for geotechnical or land contamination purposes.
Highest Astronomical Tide	HAT	The elevation of the highest predicted astronomical tide expected to occur at a specific tide station over the National Tidal Datum Epoch.
Humber International Terminal	HIT	A terminal located within the Port of Immingham.
Habitats Regulations Assessment	HRA	An assessment of projects (or plans) potentially affecting European Sites in the UK, required under the Habitats Directive and Regulations. Also known as an assessment of implications on European Sites.
Significant Wave Height	Hs	The average wave height, from trough to crest, of the highest one-third of the waves.
Humber Sea Terminal	HST	-
Institute of Environmental Management and Assessment	IEMA	A professional body for practitioners working in the fields of environmental management and assessmen
Immingham Oil Terminal	IOT	An oil terminal operating out of the Port of Immingham.
Lowest Astronomical Tide	LAT	The lowest tide level that can be expected to occur under average meteorological conditions and any combination of astronomical conditions
Light Detection and Ranging	LiDAR	An airborne mapping technique which accurately measures the height of the terrain and surface objects on the ground, through the use of a scanning laser that measures the distance between the aircraft and the ground.

Term	Acronym	Meaning
Likely Significant Effect	LSE	A significant effect should be considered likely if it cannot be excluded on the basis of objective information and it might undermine a site's conservation objectives.
Marine and Coastal Access Act 2009	MCAA	The Act introduces a new system of marine management. This includes a new marine planning system, which makes provision for a statement of the Government's general policies, and the general policies of each of the devolved administrations, for the marine environment, and also for marine plans which will set out in more detail what is to happen in the different parts of the areas to which they relate.
Mean High Water Neaps	MHWN	The average throughout a year of the heights of two successive high waters during those periods of 24 hours when the range of the tide is least.
Mean High Water Springs	MHWS	The height of Mean Water High Springs is the average throughout the year, of two successive high waters, during a 24-hour period in each month when the range of the tide is at its greatest.
Marine Management Organisation	MMO	The Marine Management Organisation is an executive non-departmental public body in the United Kingdom established under the Marine and Coastal Access Act 2009, with responsibility for English waters.
Mean Sea Level	MSL	The average height of the sea over a longer time period.
National Policy Statement for Ports	NPSfP	A National Policy Statement (NPS) providing the framework for decisions on proposals for new port development.
Ordnance Datum Newlyn	ODN	See Ordnance Datum –Ordnance Datum Newlyn is located at the Newlyn Tidal Observatory.
Preliminary Environmental Information Report	PEI Report	A report that compiles and presents the Preliminary Environmental Information gathered for a project.
Planning Inspectorate	PINS	An executive agency with responsibilities for planning appeals, national infrastructure planning applications, local plan examinations and other planning-related casework in England and Wales.
Particle Size Analysis	PSA	Particle size analysis is used to characterise the size distribution of particles in a given sample.
Particle Size Distribution	PSD	The Particle Size Distribution of a powder, granulate, suspension or emulsion indicates the frequency of particles of a certain size in a sample.

Term	Acronym	Meaning
Potential Special Protection Area	pSPA	A sites proposed for designation under the European Directive on the Conservation of Wild Birds for the protection of birds in member states.
Representative Concentration Pathway	RCP	A greenhouse gas concentration (not emissions) trajectory adopted by the IPCC for its fifth Assessment Report in 2014
Special Area of Conservation	SAC	Sites designated under EU legislation for the protection of habitats and species considered to be of European interest.
Sunk Dredged Channel	SDC	The sunk dredged channel is the deep water channel through the outer Humber that allows access to the ports.
Sea Level Rise	SLR	Sea Level Rise is the increase in level of the world's oceans due primarily because of the effects of global warming.
Special Protection Area	SPA	Sites designated under the European Directive on the Conservation of Wild Birds for the protection of birds in member states.
Suspended Sediment Concentrations	SSC	Suspended sediment concentration is the total value of both mineral and organic material carried in suspension by a river.
Peak Wave Period	Tp	The wave period associated with the most energetic waves in the total wave spectrum at a specific point.
United Kingdom	UK	-
Water Framework Directive	WFD	A European Union Directive which commits member states to achieve good status of all waterbodies (both surface and groundwater), and also requires that no such waterbodies experience deterioration in status. Good status is a function of good ecological and good chemical status, defined by a number of elements.
Waste Hierarchy Assessment	WHA	If required, this assessment will involve an evaluation of the dredge and disposal methods likely to be involved and will follow the waste hierarchy of Prevention, Preparing for re-use à Recycling, Other Recovery, Disposal.
Wind Speed	WS	-

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 17: Marine Water and Sediment Quality

Associated British Ports

Document History

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Table of contents

Tables

17 Marine Water and Sediment Quality

17.1 Introduction

17.1.1 This chapter presents the preliminary findings of the assessment of the likely effects of the Project on Marine Water and Sediment Quality.

17.1.2 There may be interrelationships related to the potential effects on Marine Water and Sediment Quality and other disciplines. Therefore, also refer to the following chapters:

a. **Chapter 9: Nature Conservation (Marine Ecology)**;

b. **Chapter 16: Physical Processes**; and

c. **Chapter 22: Major Accidents and Disasters**.

17.1.3 This chapter is also supported by the following figures (PEI Report, Volume III):

a. **Figure 17.1** Water Framework Directive (WFD) water bodies;

b. **Figure 17.2**: WFD protected areas; and

c. **Figure 17.3**: Water sampling location.

17.1.4 Relevant aspects of the Marine Water and Sediment Quality assessment presented in this chapter will inform the Water Framework Directive (WFD) Compliance Assessment and also the Habitats Regulations Assessment (HRA) which will be prepared and included in the Environmental Statement (ES).

17.2 Approach to Assessment

Scope and Methods

17.2.1 A scoping exercise was undertaken in August 2022 to establish the form and nature of the Marine Water and Sediment Quality assessment, and the approach and methods to be followed.

17.2.2 The Scoping Report (**Appendix 1.A** of PEI Report, Volume IV) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on Marine Water and Sediment Quality.

17.2.3 Following receipt of the Scoping Opinion (**Appendix 1.B** of the PEI Report, Volume IV) as to the information to be provided in the Environmental Statement (ES), the requirements set out in **Table 17.1** have been identified by the Planning Inspectorate as those to be taken account of as part of the ongoing marine water and sediment quality assessment.

Table 17.1 Scoping Opinion comments on marine water and sediment quality

Consultee	Reference, Date	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	Scoping Opinion, October 10th 2022	The Scoping Report seeks to scope changes to levels of contaminants in water (construction and operation) out of the assessment on the grounds that the Project would not directly introduce contaminants to the marine environment and good practice measures would be used to minimise and mitigate the potential for accidental spillages during dredging and disposal. The Scoping Report does not specify what these measures would be although reference is made to 'Guidance for Pollution Prevention: Works and maintenance in or near water'). However, no other detail on the likely measures has been provided. Furthermore, the Scoping Report refers to accidental spillages during dredging and disposal but makes no mention of the potential for accidental spillages during operational activities (e.g. water discharges to the Humber, accidental spillages of fuel and cargo of liquid bulk vessels). In the absence of information such as evidence demonstrating clear agreement with relevant statutory bodies, the Inspectorate is not in a position to agree to scope these matters from the assessment. Accordingly, the ES should include an assessment of these matters or the information referred to demonstrating agreement with the relevant consultation bodies and the absence of a likely significant effect. This should cross reference to Chapter 21 Major Accidents and Disasters.	A preliminary assessment of the risk of accidental spillages and associated potential impacts on water quality is provided in **Section 17.5**. Further information on mitigation measures that would be applied to minimise the risk of accidental spillages during construction and operational phases has been provided in **Section 17.4**. This also details the measures that would be in place were a spill to occur. Further information on mitigation will be provided as part of the DCO application.
	Scoping Opinion, October 10th 2022	In addition to the data sources listed in paragraph 16.2.1, the Applicant is directed to water quality data available on the Open WIMS database at https://environment.data.gov.uk/water-quality/view/landing	Environment Agency water quality monitoring data has been used to characterise the marine water quality baseline.

Consultee	Reference, Date	Summary of Response	How comments have been addressed in this chapter
	Scoping Opinion, October 10th 2022	The ES should assess the potential for chemical contamination to accumulate at the dredge disposal sites.	A preliminary assessment of potential changes to water quality from redistribution of sediment-bound contaminants based on available relevant information is presented in **Section 17.5**. Sediment contamination sampling will be carried out for the Project in 2023. Once obtained these data will be compared with Cefas Guideline Action Levels and the results summarised in the ES. This analysis will determine the suitability of sediments for disposal at sea and will inform the assessment of the impacts from redistribution of sediment-bound contaminants.
	Scoping Opinion, October 10th 2022	The methodology does not describe how the significance of effects would be determined, or how the general methodology described in Chapter 4 of the Scoping Report would be applied to this aspect specifically. The ES should clearly explain how likely significant marine water and sediment quality effects have been identified.	The assessment of impacts in the PEI Report follows IEMA and CIEEM guidelines and is detailed in **Chapter 5: EIA Approach**. Further detail on the assessment methodology will be provided in the ES.
	Scoping Opinion, October 10th 2022	Paragraph 16.6.3 indicates that contaminant concentrations in sediments would be compared to Cefas Guideline Action Levels for the Disposal of Dredged Material. These don't exist for all of the contaminants which could potentially be observed. The Applicant should consider if there is any potential to explore alternative guidance levels (e.g. those used by other agencies/countries) for contaminants not covered by the Cefas Guidelines.	Where Cefas Action Levels are not defined for certain contaminants, reference is made to other relevant thresholds/guidance as appropriate - this is noted in **Section 17.3**.

Consultee	Reference, Date	Summary of Response	How comments have been addressed in this chapter
Environment Agency	Scoping Opinion, October 10th 2022	In addition to the data sources listed in paragraph 16.2.1, we would direct the Applicant to water quality data, which is available on the Open WIMS database at https://environment.data.gov.uk/water-quality/view/landing. The Report does not specifically discuss water discharges to the Humber. Paragraph 16.4.8 states that "Changes to levels of contaminants in water (including accidental spillages) during operation" is scoped out. Under the COMAH regulations, the site will be required to complete an unmitigated assessment of the environmental impact in the event of incidents. As such, undertaking this assessment of potential impact now may provide an early indication if the project will be required to go beyond best practice. If the project intends to discharge directly to the Humber it will need to follow this guidance Surface water pollution risk assessment for your environmental permit - GOV.UK (www.gov.uk) in support of its permit application. Paragraph 16.6.3 indicates that contaminant concentrations in sediments would be compared to Cefas Guideline Action Levels. These don't exist for all of the contaminants which could potentially be observed. The Applicant should consider if there is any potential to explore alternative guidance levels (e.g. those used by other agencies/countries).	Environment Agency water quality monitoring data has been used to characterise the marine water quality baseline in **Section 17.3**. Discharges into the Humber Estuary are discussed in **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage**. Any changes to, or potential impacts, on discharges will also be considered within the WFD Compliance Assessment. A preliminary assessment of the risk of accidental spillages and associated potential impacts on water quality is provided in **Section 17.5**. Noted. Where Cefas Action Levels are not defined for certain contaminants, reference is made to other relevant thresholds/guidance as appropriate - this is noted in **Section 17.3**.

17.2.4 To facilitate the impact assessment process and ensure consistency in the terminology of significance, a standard assessment methodology will be applied to determine the significance of effects within the ES. This methodology has been developed from a range of sources, including relevant Environmental Impact Assessment (EIA) Regulations, the EIA Directive (2014/52/EU), statutory and non-statutory guidance, consultations and ABPmer's previous (extensive) EIA project experience. The assessment also follows the principles of relevant guidance, including Institute of Environmental Management and Assessment (IEMA) guidelines (Ref 17-1), and the latest Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines for ecological impact assessment in the UK and Ireland (which combine advice for terrestrial, freshwater and coastal environments) (Ref 17-2). The methodology adopted is considered to be 'best practice'. The overall assessment approach is described in detail in **Chapter 5: EIA Approach** including definitions of sensitivity/importance of receptors and magnitude of change.

17.2.5 Site-specific marine sediment samples will be collected in 2023 within the vicinity of the Project to inform the assessment. This will be conducted in line with a sediment sample plan that will be requested from the MMO. Sediments will be tested for a suite of chemical contaminants and particle size analysis completed as specified in the sediment sample plan.

Legislation, Policy and Guidance

17.2.6 **Table 17.2** presents the legislation, policy and guidance relevant to the Marine Water and Sediment Quality assessment and details how their requirements will be met in the assessment.

Table 17.2 Relevant legislation, policy and guidance regarding Marine Water and Sediment Quality

Legislation / Policy / Guidance	Consideration within the PEI Report
The Planning Act 2008 (PA2008) (Ref 17-9)	
Whilst the MCAA regulates marine licensing for works at sea, section 149A of the Planning Act 2008 enables an applicant for a DCO to include within the Order a Marine Licence which is deemed to be granted under the provisions of the MCAA.	Information relevant to the marine licensing process is provided in the PEI Report including characterisation of the marine water and sediment quality baseline (**Section 17.3**) and a preliminary assessment of impacts (**Section 17.5**).
The Marine and Coastal Access Act 2009 (MCAA) (Ref 17-8)	
The MCAA provides the legal mechanism to help ensure clean, healthy, safe, productive, and biologically diverse oceans and seas by putting in place a new system for improved management and protection of the marine and coastal environment. The MCAA established the Marine Management Organisation (MMO) as the	Information relevant to the marine licensing process is provided in the PEI Report including characterisation of the marine water and sediment quality baseline (**Section 17.3**) and a preliminary assessment of impacts (**Section 17.5**).

Legislation / Policy / Guidance	Consideration within the PEI Report
organisation responsible for marine planning and licensing. The Project will require a Marine Licence for the elements of the works below Mean High Water Springs including dredging, disposal and placing or removing objects on or from the seabed. For NSIPs the Development Consent Order (DCO) where granted may include provision deeming a marine licence to have been issued under Part 4 of the Marine and Coastal Access Act 2009. The MMO is responsible for enforcing, post-consent monitoring, varying, suspending, and revoking any deemed marine licence(s) as part of the DCO.	
The Water Environment (WFD) (England and Wales) Regulations 2017 (Ref 17-10)	
The Water Framework Directive (2000/60/EEC) is transposed into UK law through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 as amended, known as the Water Framework Regulations[1]. In terms of water and sediment quality, "Good ecological status/potential" has regard to physico-chemical quality elements, and specific pollutants. The Good ecological status/potential assessment also considers biological and hydromorphological elements. "Good chemical status" has regard to a series of priority substances and priority hazardous substances.	**Section 17.3** identifies the relevant WFD water bodies (the Project lies within the Lower Humber water body in the Humber River Basin District) and Section 17.5 provides a preliminary assessment of potential impacts on water bodies. A WFD Compliance Assessment will be undertaken to determine whether the Project complies with the objectives of the WFD.
WFD (Standards and Classification) Directions (England and Wales) 2015 (Ref 17-11)	
The Direction provide the allowable thresholds (Environmental Quality Standards (EQS)) for surface and groundwater bodies in England and Wales. This sets annual average (AA) concentrations and/or maximum allowable concentrations (MAC)) for priority substances and priority hazardous substances that are controlled under the Water Framework Regulations.	Reference is made to AA and MAC in **Section 17.5** where available baseline water and sediment quality data are compared with guideline thresholds.
Bathing Water Regulations 2013 (Ref 17-12)	
The revised Bathing Water Directive (2006/7/EC) is implemented in England and Wales under the Bathing Water Regulations 2013 (as amended).	**Section 17.3** identifies relevant bathing waters (the nearest is located approximately 11.5 km south east of the Project).

[1] Following the UK leaving the EU, the main provisions of the WFD have been retained in English law through The Floods and Water (Amendment etc.) (EU Exit) Regulations 2019. (Ref 17-39)

Legislation / Policy / Guidance	Consideration within the PEI Report
Nitrate Pollution Prevention Regulations 2015 (Ref 17-13)	
The Nitrate Pollution Prevention Regulations 2015 implement the Nitrates Directive (91/676/EEC) in England and Wales.	**Section 17.3** identifies relevant Nitrate Vulnerable Zones (NVZ). As the NVZ is landside this is considered in **Chapter 21: Ground Conditions and Land Quality**. NVZs will also be considered in the WFD Compliance Assessment.
Urban Waste Water Treatment (England and Wales) Regulations 1994 (Ref 17-14)	
The Urban Waste Water Treatment Directive (91/271/EEC) is implemented in England and Wales through the Urban Waste Water Treatment (England and Wales) Regulations 1994 (as amended). It aims to protect the environment from the adverse effects of the collection, treatment, and discharge of urban waste water.	**Section 17.3** identifies relevant Sensitive Areas. There are no sensitive areas designated under the Urban Waste Water Treatment Regulations in the vicinity of the Site.
Shellfish Water Protected Areas Directions 2016 (Ref 17-15)	
The Shellfish Water Protected Areas (England and Wales) Directions 2016 require that the Environment Agency (in England) endeavour to observe a microbial standard in all 'Shellfish Water Protected Areas'. The microbial standard is 300 or fewer colony forming units of *E. coli* per 100 ml of shellfish flesh and intravalvular liquid. The Directions also require the Environment Agency to assess compliance against this standard to monitor microbial pollution (75% of samples taken within any period of 12 months below the microbial standard and sampling/analysis in accordance with the Directions).	There are no Shellfish Water Protected Areas in the vicinity of the Project. **Section 17.3** explains that the nearest is the West Wash Shellfish Water Protected Area, located over 65 km south.
The Conservation of Habitats and Species Regulations 2017 (Ref 17-16)	
The Habitats Directive and Birds Directive are transposed into UK law through the Conservation of Habitats and Species Regulations 2017 as amended, known as the "Habitats Regulations"[2]. The Habitats Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species' and the adaptation of planning and other controls for the protection of European Sites. The Regulations also require the compilation and maintenance of a	**Section 17.3** characterises the baseline for water and sediment quality. A preliminary consideration of impacts on these receptors is described in **Section 17.5** which has informed the preliminary assessment of impacts on protected habitats and species presented in **Chapter 9:** Marine Ecology and **Chapter 10:** Ornithology. A Habitats Regulations Screening report has been produced and is provided in **Appendix 9.C** (PEI Report Volume IV)**.** This report will inform the

[2] Following the UK leaving the EU, the Conservation of Habitats and Species Regulations 2017 (Ref 17-16) have been modified by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (Ref 17-40).

Legislation / Policy / Guidance	Consideration within the PEI Report
register of European sites, to include SACs (classified under the Habitats Directive) and SPAs (classified under the Birds Directive). These sites form the Natura 2000 network. These regulations also apply to Ramsar sites (designated under the 1971 Ramsar Convention for their internationally important wetlands), candidate SACs (cSAC), potential Special Protection Areas (pSPA), and proposed and existing European offshore marine sites.	consultation process and will aid the Competent Authorities[3] in determining whether the Project has the potential for a likely significant effect (LSE) on the interest features and/or supporting habitat of a European/Ramsar site either alone or in-combination with other plans, projects and activities and, if so, will inform the requirement to undertake an Appropriate Assessment (AA) of the implications of the proposals in light of the site's conservation objectives.
National Policy Statement for Ports (NPSfP) (Ref 17-17)	
The NPSfP provides the policy framework for nationally significant infrastructure projects involving new port development (Ref 17-17). In order to meet the requirements of the Government's policies on sustainable development, the NPSfP requires that new port infrastructure should also, amongst other things, assess the impact on the water environment, including transitional and coastal waters. Section 5.6 of the NPSfP advises that applicants should assess the existing status and impacts of the Project on water quality, water resources and physical characteristics of the water environment as part of the ES. The ES should describe: • The existing quality of waters affected by the Project and the impacts of the Project on water quality, noting any relevant existing discharges, proposed new discharges and proposed changes to discharges; • Existing water resources affected by the Project and the impacts of the proposed project on water resources, noting any relevant existing abstraction rates, proposed new abstraction rates and proposed changes to abstraction rates; • Existing physical characteristics of the water environment (including quantity and dynamics of flow) affected by the Project and any impact of physical modifications to these characteristics; • Any impacts of the Project on water bodies or protected areas under the WFD and	A Marine water and sediment quality chapter has been prepared for the PEI Report. A preliminary consideration of impacts to marine water and sediment quality are presented in **Section 17.5**. The mitigation measures that are proposed to be implemented as standard good practice to manage water quality impacts are presented in **Section 17.4**. An outline Construction Environmental Management Plan (CEMP) will be prepared and provided with the DCO application which will set out the mitigation measures considered necessary to manage environmental effects. A preliminary consideration of surface water discharges is presented in **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage**. A preliminary consideration of groundwater and surface water abstractions is presented in **Chapter 21: Ground Conditions and Land Quality**. A preliminary consideration of the physical characteristics of the water environment is presented in **Chapter 16: Physical Processes**. A preliminary consideration of impacts on WFD water bodies is provided in **Section 17.5**. This will also be assessed in the WFD Compliance Assessment which will be submitted with the DCO application. A preliminary assessment of any cumulative water and sediment quality effects that could arise from the Project alone, as well as through other plans, projects and ongoing activities within the study

[3] The MMO and North East Lincolnshire are Competent Authorities for the HRA. However it is noted that ABP is also a Competent Authority under the UK Habitats Regulations.

Legislation / Policy / Guidance	Consideration within the PEI Report
source protection zones (SPZs) around potable groundwater abstractions; and • Any cumulative effects.	area is considered in **Chapter 25: Cumulative Effects and In-Combination Assessment**.
UK Marine Policy Statement (MPS) (Ref 17-18)	
The MPS (Ref 17-18) is the framework for preparing marine plans and taking decisions affecting the marine environment. The MPS also sets out the general environmental, social, and economic considerations that need to be taken into account in marine planning and provides guidance on the pressures and impacts that decision makers need to consider when planning for and consenting development in the UK marine areas. Section 2.6.4 of the MPS is relevant to the Marine Water and Sediment Quality assessment. In particular, paragraph 2.6.4.3 states, amongst other things, that - "*The marine plan authority should satisfy itself where relevant that any development will not cause a deterioration in status of any water to which the WFD applies... Decision makers should also take into account impacts on the quality of designated bathing waters and shellfish waters from any proposed development.*"	A marine water and sediment quality chapter has been prepared for the PEI Report. A preliminary consideration of impacts to marine water and sediment quality is presented in **Section 17.5**. A WFD Compliance Assessment will be undertaken to determine whether the Project complies with the objectives of the WFD.
UK Marine Strategy (Ref 17-19)	
The aim of the UK Marine Strategy is to protect the UK's marine environment. The Strategy sets out a comprehensive framework for assessing, monitoring, and taking action to achieve the UK's shared vision for clean, healthy, safe, productive, and biologically diverse seas (Ref 17-20). It aims to achieve good environmental status of marine waters by 2020 (followed by a six-year review) and then to protect the resource base upon which marine-related economic and social activities depend. The Strategy constitutes a vital environmental component of future maritime policy, designed to achieve the full economic potential of oceans and seas in harmony with the marine environment. The UK Marine Strategy applies to the landward boundary of coastal waters as defined under the WFD (i.e., from mean high water springs (MHWS)) to the outer limit of the UK Exclusive Economic Zone (EEZ), as well as the area of UK continental shelf beyond the EEZ. Government reporting	The Project is not located within a UK Marine Strategy region (it lies within the Lower Humber WFD transitional (estuarine) water body). The anticipated pressures exerted on the marine environment by the Project are considered to be of small magnitude in the context of UK Marine Regions such that they are unlikely to be a significant issue. The Strategy is, therefore, not considered further in this PEI Report with regards to the Marine Water and Sediment Quality assessment.

Legislation / Policy / Guidance	Consideration within the PEI Report
against the Strategy is a cyclical process, and the most recent assessments and Marine Strategy documents were updated in 2019.	
East Inshore and East Offshore Marine Plans (Ref 17-21)	
The first Marine Plans include the East Inshore and East Offshore Marine Plans, which are collectively referred to as 'the East Marine Plans'. These were formally adopted on 2 April 2014 (Defra, 2014). There is one policy within the East Marine Plans specifically related to water and sediment quality: Policy ECO2 - "*The risk of release of hazardous substances as a secondary effect due to any increased collision risk should be taken account of in proposals that require an authorisation":* There are also several references to the importance of water quality in supporting a healthy ecosystem and the potential for pollutants to affect the environment as well as people (from marine as well as riverine and terrestrial sources).	The potential risk of vessel collisions as a result of the Project are considered in **Chapter 12: Marine Transport and Navigation**. The risks, consequences and mitigation measures relating to potential accidental release of hazardous substances is presented in **Chapter 22: Major Accidents and Disasters**. The impacts of the Project on Marine Water and Sediment Quality are assessed at this preliminary stage in **Section 17.5** of this chapter. **Chapter 9: Nature Conservation (Marine Ecology)** also provides a preliminary assessment of the impacts to marine habitats and species due to changes in water and sediment quality.
North East Lincolnshire Local Plan 2013 to 2032 (Ref 17-22)	
The North East Lincolnshire Local Plan was adopted in 2018 and covers the period 2013 to 2032. Within its Spatial Portrait, the Local Plan highlights the importance of the 'Estuary Zone' of the local authority area, which includes the 'nationally important port' of Immingham. When considering the detail of how the economy of the area will be developed, the Plan specifically identifies at the outset that there are good expectations of growth within the ports and logistics sector. On the policies map which accompanies the Local Plan, the Site is shown as being located within an area identified as 'Employment – Operational Port'. In addition, Policy 34 of the plan makes clear that: *"Water management* *1. Development proposals that have the potential to impact on surface and ground water should consider the objectives and programme of measures set out in the Humber River Basin Management Plan."* The Humber River Basin Management Plan provides a framework for protecting and	The Project is located largely within the administrative area of North East Lincolnshire, although elements of the marine infrastructure fall beyond the local Council's administrative boundary. A preliminary consideration of impacts on WFD water bodies is provided in **Section 17.5**. This will also be assessed in the WFD Compliance Assessment which will be submitted with the DCO application and will consider WFD objectives as outlined in the Humber River Basin Management Plan.

Legislation / Policy / Guidance	Consideration within the PEI Report
enhancing the benefits provided by the water environment within the Humber River Basin District and informs decisions on land-use planning. The Humber River Basin District covers an area of 26,100 km² and extends from the West Midlands in the south, northwards to North Yorkshire and from Staffordshire in the west to part of Lincolnshire and the Humber Estuary in the east	
Clearing the Waters for All (Ref 17-23)	
In 2016, the Environment Agency published guidance, referred to as "Clearing the Waters for All", regarding how to assess the impact of activities in WFD transitional and coastal water bodies (Ref 17-23). The guidance sets out the following three discrete stages for WFD compliance assessments to follow: Screening: excludes any activities that do not need to go through the scoping or impact assessment stages; Scoping: identifies the receptors and quality elements that are potentially at risk from an activity and need further detailed assessment; and Assessment: considers the potential impacts of an activity, identifies ways to avoid/minimise impacts, and indicates if it may cause deterioration or jeopardise the water body achieving good status.	The WFD Compliance Assessment for the Project will follow the format specified in this guidance.
PINS Advice Note Eighteen: The Water Framework Directive (Ref 17-24)	
Advice Note Eighteen (Ref 17-24) explains the information that the Inspectorate considers an applicant must provide with their Nationally Significant Infrastructure Project (NSIP) application in order to clearly demonstrate that the WFD and the Water Environment (WFD) (England and Wales) Regulations 2017 have been appropriately considered. The Advice Note also refers to Environment Agency guidance (as described above) in terms of the WFD process and the information required. Furthermore, the guidance describes the relevant bodies to be consulted in the pre-application process, and the presentation of information.	The WFD Compliance Assessment for the Project will contains the information specified in this guidance as appropriate.

Stakeholder Engagement

17.2.7 A range of stakeholders have been engaged as part of the scoping process to obtain their views on the Project and the scope of the Marine Water and

Sediment Quality assessment, the results of which are presented within the Scoping Opinion (**Appendix 1.B** of the PEI Report, Volume IV) and in **Table 17.1**.

Limitations and Assumptions

17.2.8 The information presented in this preliminary assessment reflects that obtained and evaluated at the time of reporting and is based on an emerging design for the Project and the maximum likely extent of land required for its construction and operation.

17.2.9 This preliminary assessment has been undertaken based on the following assumptions:

a. Dredging is undertaken by a combination of backhoe dredger (e.g. Mannu Pekka or similar) and potentially trailing suction hopper dredger (TSHD) (e.g. Cork Sand and Long Sand or similar). The backhoe dredging will involve the excavated material being loaded directly to attendant barges for disposal. Dredge operations will be continuous and operate 24 hours a days and seven days a week;

b. There will be subsequent transit of material and disposal at existing licensed disposal sites, Clay Huts disposal site (HU060) or the Holme Channel (HU056) disposal site;

c. That barge access to the disposal sites can be achieved throughout the full tidal cycle (this is considered to be a conservative, worst-case assumption for dredging and disposal operations and the subsequent plume development);

d. The dredge volumes assumed are a total of approximately 100,000 m^3. This value (including a split across material type) will be confirmed by sediment sampling carried out in line with OSPAR[4] requirements; and

e. Assessment of sediment release rates are based on modelling outputs presented in **Chapter 16: Physical Processes**.

17.2.10 The assessment within this PEI Report has been undertaken considering the anticipated worst-case scenario in respect of water and sediment quality receptors at the dredge, piling and disposal locations.

17.2.11 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further through the assessment and consultation processes, and as further research and investigative surveys are completed to fully understand its potential effects. The finalised assessment will be presented in the ES.

Study Area

17.2.12 The study area for this assessment is the area over which potential direct and indirect effects of the Project are predicted to occur during the construction and

[4] OSPAR' relates to the Convention for the Protection of the Marine Environment of the North-East Atlantic.

operational periods. The direct effects on water and sediment quality are those that may arise due to accidental releases during construction or disturbance of sediments into the water column and increases in turbidity. Indirect effects are those that may arise due to sediment that is disturbed and released into the water column during the marine works resulting in changes in water quality through changes in the levels of dissolved oxygen or the release of sediment-bound contaminants.

17.2.13 The study area for the water and sediment quality topic is considered to be the Site and the adjacent Immingham coastline, the existing jetties across the near-field and the central part of the Humber Estuary, generally between Sunk Chanel and Halton Middle. Within the far-field region, the study area includes the wider Humber Estuary from the mouth up to estuary of the Hull Bend.

17.3 Baseline Conditions

Current Baseline

Water quality

Water Framework Directive

17.3.1 Water quality standards and objectives are implemented through a range of legislation including the Water Framework Regulations, the Bathing Water Regulations, and the UK Marine Strategy (see **Table 17.1**).

17.3.2 The Environment Agency published River Basin Management Plans (RBMPs), which set out measures through which compliance with WFD objectives will be achieved. The Humber River Basin District RBMP identifies the Humber Lower water body (ID: GB530402609201) within and surrounding the Project (including Humber Estuary disposal sites) (Ref 17-25) (**Figure 17.1** (PEI Report, Volume III)). It is recorded as a heavily modified water body (HMWB) due to coastal protection use, flood protection use, and navigation use. This means 'ecological potential' is applied rather than 'ecological status'. The current (2019) overall status of this waterbody is 'moderate', with an ecological potential of 'moderate', and a chemical status of 'fail'. The reason for the 'fail' chemical status is based on priority substances cypermethrin and dichlorvos, and priority hazardous substances polybrominated diphenyl ethers (PBDE), perfluorooctane sulphonate (PFOS), benzo(b)fluoranthene, benzo(g-h-i)perylene, mercury and its compounds, and tributyltin compounds. The source of contaminants is not known but may relate to historical industrial and maritime activities on the Humber. Surface water bodies overlapping the landside works are detailed in **Chapter 18: Water Quality** and **Chapter 21: Ground Conditions and Land Quality**.

Bathing Waters

17.3.3 Cleethorpes designated bathing waters is located approximately 11.5 km south east of the Project, and Humberston Fitties is located approximately 15 km south east (**Figure 17.2** (PEI Report, Volume III)). Cleethorpes was assessed as having 'good' bathing water quality in 2021 (Ref 17-26), declining from an

'excellent' classification in 2019. Humberston Fitties was assessed as having 'good' bathing water quality in 2021 (Ref 17-26), remaining consistent with a 'good' classification in 2019.

Shellfish Water Protected Areas

17.3.4 There are no Shellfish Water Protected Areas in the vicinity of the Project (Ref 17-27). The nearest is the West Wash Shellfish Water Protected Area, located over 65 km south.

Nitrate Vulnerable Zones

17.3.5 The landside extent of the Project is located on land included in the North Beck Drain NVZ, covering Immingham as well as South Killingholme and Healing, as designated under the Nitrates Pollution Prevention Regulations (Ref 17-28) (**Figure 17.2** (PEI Report, Volume III)).

Sensitive Areas

17.3.6 There are no sensitive areas designated under the Urban Waste Water Treatment Regulations in the vicinity of the Site (Ref 17-29)

17.3.7 The main watercourses in the vicinity of the Site (within 5 km) are South Killingholme Haven which drains to the north-west corner of the Port of Immingham (but is defined as part of the Humber Estuary water body), North Killingholme main drain, Habrough Marsh drain and the Humber Estuary itself.

Water quality monitoring

17.3.8 The Environment Agency's 'Water Quality Archive' (Ref 17-30) provides data on water quality measurements taken at sampling points around England. These can be from coastal or estuarine waters, rivers, lakes, ponds, canals or groundwaters. They are taken for a number of purposes including compliance assessment against discharge permits, investigation of pollution incidents or environmental monitoring.

17.3.9 The nearest saline water sampling point to the Project (with adequate temporal coverage and a reasonable amount of determinands measured) is Clean Site - Ti02 Monitoring Point, 1985 (sampling ID: AN-CLNMON1). This is shown on **Figure 17.3** (PEI Report, Volume III). Contaminant concentrations measured in the water at this location are shown in **Table 17.3**. These are compared against environmental quality standards (EQS) as described under the WFD (Standards and Classification) Directions (England and Wales) 2015, specifically annual average (AA) concentrations and/or maximum allowable concentrations (MAC) to provide an indication of the water quality measured at the sampling point. As indicated below in **Table 17.3**, metal concentrations reported between 2015 and 2022 were typically below respective EQSs. There were some exceedances related to the AA EQS for tributyl tin (TBT) and the Humber Estuary transitional water body was failing chemical status due to excessive concentrations of TBT in 2019. Benzo(a)pyrene and benzo(g,h,i)perylene were failing their respective MAC EQSs between 2015 and 2021. Benzo(b)fluoranthene was also failing its MAC EQSs in 2015 to 2021 (with the exception 2019), and benzo(k)fluoranthene

were also failing its MAC EQSs in 2016 to 2018. The Humber Lower transitional water body was failing chemical status due to benzo(b)fluoranthene and benzo(g-h-i)perylene in 2019.

Table 17.3 Concentration range, mean and number of water samples collected between 2015 and 2022 by the Environment Agency for contaminants measured near the Project

Parameter	Unit	EQS	2015	2016	2017	2018	2019	2020	2021	2022
Arsenic	µg/l	25 (AA)	1.9 – 2.39 $\bar{x}$ = 2.10 (n = 3)	2.32 (n = 1)	-	1.94 – 2.59 $\bar{x}$ = 2.276667 (n = 3)	1.95 (n = 1)	-	-	-
Cadmium	µg/l	0.2 (AA)	0.044 – 0.101 $\bar{x}$ = 0.077 (n = 9)	0.041 – 0.066 $\bar{x}$ = 0.04875 (n = 4)	0.062 – 0.063 $\bar{x}$ = 0.063 (n = 2)	0.046 – 0.14 $\bar{x}$ = 0.089 (n = 9)	0.0408 – 0.0706 $\bar{x}$ = 0.055433 (n = 3)	-	0.058 – 0.12 $\bar{x}$ = 0.084 (n = 8)	0.051 – 0.079 $\bar{x}$ = 0.066 (n = 8)
Chromium (VI)	µg/l	0.6 (AA); 32 (MAC)	<0.3 (n = 1)	<0.3 (n = 1)	-	<0.3 (n = 3)	<0.3 (n = 1)	-	-	-
Copper	µg/l	3.76 (AA)	1.7 – 2.62 $\bar{x}$ = 2.01 (n	2.35 – 2.96 $\bar{x}$ = 2.85 (n = 2)	2.35 – 2.96 $\bar{x}$ = 2.66 (n = 2)	1.99 – 2.52 $\bar{x}$ = 2.2 (n = 3)	1.59 (n = 1)	-	1.7 – 3.2 $\bar{x}$ = 2.19 (n = 8)	1.7 – 2.3 $\bar{x}$ = 1.96 (n = 8)
Lead	µg/l	1.3 (AA); 14 (MAC)	<0.04 – 0.074 $\bar{x}$ = 0.056 (n = 9)	0.04 – 0.098 $\bar{x}$ = 0.07 (n = 3)	-	<0.04 – 0.088 $\bar{x}$ = 0.053189 (n = 9)	0.0656 – 0.108 $\bar{x}$ = 0.0798 (n = 3)	-	0.046 – 0.12 $\bar{x}$ = 0.069 (n = 8)	0.04 – 0.084 $\bar{x}$ = 0.065 (n = 8)

Parameter	Unit	EQS	2015	2016	2017	2018	2019	2020	2021	2022
Mercury	µg/l	0.07 (MAC)	<0.01 (n = 9)	<0.01 (n = 3)	-	<0.01 (n = 9)	<0.01 (n = 3)	-	-	-
Nickel	µg/l	8.6 (AA); 34 (MAC)	1.25 – 2.29 $\bar{x}$ = 1.69 (n = 9)	1.14 – 2.11 $\bar{x}$ = 1.61 (n = 4)	1.79 – 2.11 $\bar{x}$ = 1.95 (n = 2.11)	1.4 – 2.00 $\bar{x}$ = 1.71 (n = 8)	1.35 – 1.8 $\bar{x}$ = 1.54 (n = 3)	-	1.4 – 7.8 $\bar{x}$ = 2.43 (n = 8)	1.3 – 1.6 $\bar{x}$ = 1.41 (n = 8)
Zinc	µg/l	7.9 (AA)	2.2 – 4.7 $\bar{x}$ = 3.79 (n = 3)	3.47 – 4.86 $\bar{x}$ = 4.165 (n = 2)	4.22 – 4.86 $\bar{x}$ = 4.54 (n = 2)	2.21 – 4.32 $\bar{x}$ = 3.15 (n = 3)	4.05 (n = 1)	-	1.9 – 5.7 $\bar{x}$ = 3.29 (n = 8)	1.9 – 3.4 $\bar{x}$ = 2.93 (n = 8)
Tributyltin (TBT)	µg/l	0.0002 (AA); 0.0015 (MAC)	0.00021 – 0.00096 $\bar{x}$ = 0.00044 (n = 9)	<0.0002 – 0.0008 $\bar{x}$ = 0.00041 (n = 12)	0.00029 – 0.00092 $\bar{x}$ = 0.00052 (n = 3)	<0.0002 – 0.00081 $\bar{x}$ = 0.00030 (n = 10)	0.00025 – 0.00032 $\bar{x}$ = 0.00029 (n = 2)	-	0.0002 – 0.00023 $\bar{x}$ = 0.0002 (n = 8)	0.0002 – 0.00036 $\bar{x}$ = 0.00023 (n = 8)
Benzo(a)pyrene	µg/l	0.00017 (AA); 0.0027 (MAC)	>0.002 - <0.01 $\bar{x}$ = 0.0087 (n = 12)	>0.002 – 0.22 $\bar{x}$ = 0.042 (n = 12)	0.00055 – >0.05 $\bar{x}$ = 0.026 (n = 0.026)	<0.0004 – 0.0874 $\bar{x}$ = 0.033 (n = 8)	0.015 – 4.05 $\bar{x}$ = 1.02 (n = 4)	-	0.0004 – 0.033 $\bar{x}$ = 0.013 (n = 8)	0.0005 – 0.026 $\bar{x}$ = 0.007 (n = 8)
Benzo(g,h,i)perylene	µg/l	0.00082 (MAC)	>0.002 – <0.01 $\bar{x}$ = 0.0087 (n = 12)	>0.002 – 0.24 $\bar{x}$ = 0.042 (n = 12)	0.00063 – >0.05 $\bar{x}$ -= 0.025 (n = 3)	0.00057 – 0.091 $\bar{x}$ = 0.026 (n = 8)	0.015 – 0.018 $\bar{x}$ = 0.017 (n = 2)	-	0.0004 – 0.03 $\bar{x}$ = 0.011 (n = 8)	0.0005 – 0.024 $\bar{x}$ = 0.006 (n = 8)

Parameter	Unit	EQS	2015	2016	2017	2018	2019	2020	2021	2022
Benzo(b)fluoranthene	µg/l	0.017 (MAC)	>0.002 – 0.20 $\bar{x}$ = 0.038 (n = 12)	>0.002 – 0.20 $\bar{x}$ = 0.038 (n = 12)	0.00056 - >0.05 $\bar{x}$ = 0.024 (n = 3)	0.00045 – 0.074 $\bar{x}$ = 0.028 (n = 8)	0.013 – 0.014 $\bar{x}$ = 0.013 (n = 2)	-	0.0005 – 0.03 $\bar{x}$ = 0.011 (n = 8)	0.0005 – 0.021 $\bar{x}$ = 0.006 (n = 8)
Benzo(k)fluoranthene	µg/l	0.0063 (AA); 0.017 (MAC)	>0.002 – <0.01 $\bar{x}$ = 0.0087 (n = 12)	>0.002 – 0.11 $\bar{x}$ = 0.024 (n = 12)	<0.0004 – >0.05 $\bar{x}$ = 0.021 (n = 3)	<0.0004 – 0.038 $\bar{x}$ = 0.015 (n = 8)	0.0070 – 0.0075 $\bar{x}$ = 0.0072 (n = 2)	-	0.0004 – 0.016 $\bar{x}$ = 0.006 (n = 8)	0.0004 – 0.012 $\bar{x}$ = 0.004 (n = 8)
Fluoranthene	µg/l	0.12 (MAC)	>0.002 - <0.01 $\bar{x}$ = 0.0087 (n = 12)	>0.002 – 0.14 $\bar{x}$ = 0.036 (n = 12)	0.00103 - >0.05 $\bar{x}$ = 0.027 (n = 3)	<0.0004 – 0.095 $\bar{x}$ = 0.031 (n = 8)	0.016 – 0.019 $\bar{x}$ = 0.018 (n = 3)	-	0.0015 – 0.026 $\bar{x}$ = 0.012 (n = 8)	0.0012 – 0.023 $\bar{x}$ = 0.009 (n = 8)
Hexachlorobenzene	µg/l	0.05 (MAC)	<0.001 (n = 12)	<0.0001 – 0.001 $\bar{x}$ = 0.00049 (n = 7)	<0.0001 – 0.005 $\bar{x}$ = 0.0020 (n = 3)	-	-	-	-	-
Hexachlorobutadiene	µg/l	0.6 (MAC)	<0.003 (n = 12)	<0.0001 – <0.001 $\bar{x}$ = 0.00049 (n = 7)	<0.0001 – <0.005 $\bar{x}$ = 0.0020 (n = 3)	-	-	-	-	-

Parameter	Unit	EQS	2015	2016	2017	2018	2019	2020	2021	2022
BDE 28	µg/l	-	<0.0006 (n = 7)	<0.0006 (n = 7)	<0.0006 (n = 3)	-	-	-	-	-
BDE 47	µg/l	-	<0.0006 - 0.0001 $\bar{x}$ = 0.000065 (n = 7)	<0.0006 (n = 7)	<0.0006 (n = 3)	-	-	-	-	-
BDE 99	µg/l	-	<0.0006 – 0.00017 $\bar{x}$ = 0.000076 (n = 7)	<0.0006 (n = 7)	<0.0006 (n = 3)	-	-	-	-	-
BDE 100	µg/l	-	<0.0006 – 0.00017 $\bar{x}$ = 0.000076 (n = 7)	<0.0006 (n = 7)	<0.0006 (n = 3)	-	-	-	-	-
BDE 153	µg/l	-	<0.0006 – 0.0007 $\bar{x}$ = 0.000061 (n = 7)	<0.0006 (n = 7)	<0.0006 (n = 3)	-	-	-	-	-
BDE 154	µg/l	-	<0.0006 (n = 7)	<0.0006 (n = 7)	<0.0006 (n = 3)	-	-	-	-	-

Parameter	Unit	EQS	2015	2016	2017	2018	2019	2020	2021	2022
$\bar{x}$ = mean n = number of water samples Data from sampling point 'Clean Site - Ti02 Monitoring Point, 1985, ID: AN-CLNMON1)' in the Humber Estuary, obtained from the Environment Agency's 'Water Quality Archive' (Ref 17-25)										

Sediment quality

17.3.10 The UK has not adopted formal quantitative EQS for sediments. In the absence of any quantified UK standards, therefore, common practice for characterising baseline sediment quality conditions is to compare against the Cefas Guideline Action Levels for the disposal of dredged material (Ref 17-31).

17.3.11 Cefas Guideline Action Levels are used as part of a 'weight of evidence' approach to assessing material suitability for disposal at sea. Cefas guidance indicates that, in general, contaminant levels below Action Level 1 (AL1) are of no concern. Material with contaminant levels above Action Level 2 (AL2), however, is generally considered unsuitable for disposal at sea whilst dredged material with contaminant levels between AL1 and AL2 requires further consideration before a decision can be made as to disposal. Consequently, the Action Levels should not be viewed as pass/fail thresholds, and it is also recognised that these guidelines are not statutory requirements. Cefas Action Levels are not available for every determinand and where appropriate comparisons may be made to other alternative guidance levels, e.g. Canadian Sediment Quality Guidelines or thresholds from other European/OSPAR[5] nations, to provide context. It is also noted that Action Levels in the UK are currently being reviewed but have yet to be formally adopted (Ref 17-32). The latest adopted guidelines will be used to inform the assessment of effects in the ES.

17.3.12 Borehole logs were collected in 2001 to inform the dredge and disposal of material for the development of Immingham Outer Harbour (IOH) (Ref 17-33). These were taken to the west of the Project between Immingham Bulk Terminal and Western Jetty. Four borehole samples were analysed for trace metals, organotins, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs) (BH206, BH209, BH210 and BH212). This information is relevant given that contamination of sediments at depth is very unlikely to have changed over this time as they remain in situ and are not remobilised in contrast to surface sediments. Information has been used to provide context to the preliminary assessment.

17.3.13 Considering all contaminants and samples together, the sediments within the top 4 m of the alluvium in the area of the IOH dredge were considered to have slight to moderate levels of contamination. The levels were approximately in line with that experienced throughout the estuary during the time they were sampled. Anthropogenic pollution of heavy metals and organochlorides/ organotins have only been in existence for the last 200 years and from port activity at Immingham since the early 1900s. Pollution inputs to the estuary were likely to have been highest in the 1950s through to the 1970s, with a general trend towards cleaner inputs and thereby cleaner sediments since the early 1990s (Ref 17-33).

17.3.14 Recent sediment sampling has also been undertaken in the vicinity of the proposed marine works in October 2021. Sediment samples were collected from

[5] Countries signed up to the OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic.

ten stations, including subsurface samples, and tested for trace metals, organotins, PAHs, PCBs, polybrominated diphenyl ethers (PBDEs) and organochloride pesticides (OCPs). The results showed that contaminant concentrations were generally low, with most values below the respective AL1 or marginally exceeding AL1. There were no instances where the concentration exceeded the respective AL2 (or a sample concentration was close to exceeding this threshold). In general, concentrations were also typically higher in surface samples compared to those obtained at depth, supporting the conclusions drawn from the borehole logs collected for the IOH development summarised above.

17.3.15 Site-specific marine sediment samples will be collected in early 2023 within the vicinity of the Project to inform the assessment. This will be conducted in line with a sediment sample plan that will be requested from the MMO. Sediments will be tested for PSA and a suite of chemical contaminants as specified in the sediment sample plan.

Future baseline

17.3.16 In the absence of the Project, water and sediment quality will continue to be influenced by natural and human-induced variability, ongoing cyclic patterns, and trends (e.g. changes in prevalence of chemicals in marine sediments in response to legislative controls, degradation of some contaminants, ongoing maintenance dredging and disposal, and existing discharge licences in the area). The future baseline will also be influenced by climate change, such as changes in sea pH and temperature, which in turn can have an impact on water quality (e.g. dissolved oxygen concentrations).

17.4 Design, Mitigation and Enhancement Measures

Embedded Mitigation Measures

17.4.1 The Project has been designed, as far as possible, to avoid and minimise impacts and effects to marine water and sediment quality through the process of design development, and by embedding mitigation measures into the design, such as minimising the dredge requirements as far as possible.

Standard Mitigation Measures

17.4.2 Standard mitigation measures will be undertaken to manage commonly occurring environmental effects. Although these are not likely to alter the assessment conclusions, they are considered to be standard good practice. In terms of water and sediment quality, the potential risk from accidents and spillages/leaks during construction will be avoided or minimised by ensuring that the construction methods, proposed design, and the contractual arrangements follow environmental management best practice. In particular, the following guidance will be adopted:

a. ‘Pollution prevention for businesses’ Guidance in England (Ref 17-34);

b. Pollution Prevention Guidance (PPG), or Guidance for Pollution Prevention (GPP) in the UK (Ref 17-35);

i Understanding Your Environmental Responsibilities – Good Environmental Practices (PPG1);

ii Works and maintenance in or near water (GPP5);

iii Working at construction and demolition sites (PPG6); and

iv Safe storage and disposal of used oils (GPP8).

c. The Oil Care Code; and

d. CIRIA's Environmental Good Practice on Site (Ref 17-36).

17.4.3 In adhering to this guidance, a number of good practice measures will be followed. All wastes generated on site will be removed in a timely manner and any materials and containers giving rise to possible spills or contamination of the surrounding environment will be taken from site to be processed at a licensed facility. Liquid oils/chemicals required for use during construction will be stored in suitable containers/bunded storage areas. In the event of a pollution incident measures to report, manage, and minimise any impacts will be pursued, with construction spill response procedures to contain any accidental spills. In addition, an oil spill contingency plan is currently in place for the Port of Immingham to minimise any impacts in the event of a spill entering the water and these measures would also be applicable to the Project.

17.4.4 Plant will also be maintained regularly, and spill kits will be available for use in the event of a spill onsite. Refuelling will be in designated areas to limit the potential for spillages. Fuel will be stored in the site compound overnight, limiting the potential for fuel theft and vandalism which could cause pollution. Should any pollution incidents occur, they will be reported immediately to the relevant authorities. The workforce will be trained in preventing and dealing with pollution incidents.

17.4.5 The Outline CEMP that will be provided with the DCO application will set out the mitigation measures to manage environmental effects during construction as described above.

17.5 Potential Impacts and Effects

17.5.1 The preliminary assessment has identified potential likely effects on marine water and sediment quality receptors as a result of the construction and subsequent operation of the Project.

17.5.2 The Physical Processes assessment (**Chapter 16: Physical Processes**) has informed the outcomes of the Marine Water and Sediment Quality assessment.

Construction

17.5.3 This section contains a preliminary assessment of the potential impacts to water and sediment quality receptors as a result of the construction phase of the Project. The following impact pathways have been identified as having potential for significant effects and have been assessed:

a. Changes to dissolved oxygen concentrations as a result of increased Suspended Sediment Concentrations (SSC) during piling, capital dredging and disposal activities;

b. Changes to chemical water quality as a result of potential sediment-bound contaminants being released during piling, capital dredging and disposal activities;

c. Redistribution of sediment-bound contaminants during piling, capital dredging and disposal activities; and

d. Changes to marine water quality from accidental spillages or leaks during construction.

17.5.4 The construction of the Project may be completed in a single stage, or it may be sequenced such that construction of Berth 2 takes place at the same time as operation of Berth 1 (see **Chapter 2: The Project**). However, in any case, all capital dredging (and associated disposal activity) will be undertaken together at one time, before operation of Berth 1 commences. In the case of a sequenced construction, the duration of piling will be extended but it will not increase the magnitude of change and therefore would not change the predicted overall effect. Furthermore, piling and construction activities associated with Berth 2 will not be undertaken at the same time as maintenance dredging and disposal during operation (see 'Operational phase' section) of Berth 1 (i.e., piling and construction will pause whilst any maintenance dredging and disposal activities are being undertaken). Therefore, the below impact pathway assessments are considered the worst case and will not be altered by a sequenced construction period.

Changes to dissolved oxygen concentrations as a result of increased SSC

Capital dredging

17.5.5 The increase in chemical and biological oxygen demand associated with elevated SSC in the water column during capital dredging may have the potential to reduce dissolved oxygen concentrations. PSA will be undertaken as part of the site-specific marine sediment sampling and included in the respective ES chapter. At this preliminary stage, the material within the proposed dredge area is considered likely to range from coarse sediments (sands and gravel) which are unlikely to influence dissolved oxygen concentrations, to clays including alluvium deposits containing organic material for which organic content can result in reduced dissolved oxygen concentrations. For the use of backhoe, 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 bucket). The use of a TSHD will transfer the material quickly and directly to a hopper via suction pipe, with only a small proportion raised into suspension by the action of the draghead on the seabed.

17.5.6 The proposed dredge area is situated within the Humber Lower transitional water body. The physico-chemical quality element 'Dissolved oxygen' is currently, based on the 2019 interim classification, at high status for this water body,

despite the area being subject to regular maintenance dredging activities. It is, therefore, considered unlikely that dissolved oxygen concentrations will fall below the standards set under the WFD as a result of the proposed capital dredging.

17.5.7 Numerical modelling has been carried out to inform the assessment of the impacts of capital dredging on SSC and this indicates that increases in SSC will be short-term and localised to the dredging activity (see **Chapter 16: Physical Processes**). It is anticipated that any reduction in dissolved oxygen concentration will be short-lived and replenished over the subsequent tidal cycle. Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Piling

17.5.8 The increase in chemical and biological oxygen demand associated with elevated SSC in the water column during piling activity may, as with dredging, have the potential to reduce dissolved oxygen concentrations. However, numerical modelling has shown that the effects are highly localised (see **Chapter 16: Physical Processes**). The piling activity is proposed to occur within the Humber Lower transitional water body, for which the physico-chemical quality element 'Dissolved oxygen' is currently, based on the 2019 interim classification, at high status. The seabed in the area is already subject to regular disturbance (e.g., maintenance dredging) and, therefore, it is considered unlikely that dissolved oxygen concentrations will fall below the standards set under the WFD as a result of piling.

17.5.9 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Disposal activities

17.5.10 The disposal of dredged material at sea associated with the Project will be fulfilled at licensed disposal sites HU056 (for any inerodible boulder/glacial clay) and HU060 (for any sand/silt (alluvium) material) (see **Chapter 2: The Project**). Numerical modelling has been carried out to inform the assessment of the impacts of disposal on SSC (see **Chapter 16: Physical Processes**).

17.5.11 During the placement of dredged material at the licensed disposal sites, the potential for reduction in dissolved oxygen concentrations in the water column is considered to be low based on modelling of the sediment plume dispersal which indicates that SSC levels are likely to become immeasurable above baseline within 1 km of the disposal site. The measurable plume from each disposal operation is only likely to persist for a single tidal cycle (less than 6 hours from disposal). After this time, the dispersion under the peak flood or ebb tidal flows means concentrations will have reverted to background levels (see **Chapter 16: Physical Processes**). Any changes would be localised and short-lived given the dynamic nature of the site, which would rapidly be re-oxygenated. Both HU056 and HU060 licensed disposal sites are located within the Humber Lower transitional water body for which the physico-chemical quality element 'Dissolved oxygen' is currently, based on the 2019 interim classification, at high status,

despite routinely receiving maintenance dredging material from the ports within the Humber Estuary.

17.5.12 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Changes to chemical water quality as a result of potential sediment-bound contaminants

Capital dredging

17.5.13 The proposed dredge area is situated within the Humber Lower transitional water body. This water body is currently, based on a 2019 interim classification, failing chemical status due to cypermethrin and dichlorvos, PBDEs, perfluorooctanesulfonic acid (PFOS), benzo(b)fluoranthene, benzo(g-h-i)perylene, mercury and its compounds and tributyl tin (TBT) compounds.

17.5.14 As sediment is disturbed and re-distributed into the water column, any sediment-bound contaminants may be partitioned from the solid phase (i.e. bound to sediments or suspended matter), to the dissolved or aqueous phase (i.e. dissolved in pore water or overlying water) (Ref 17-37). To determine the maximum dissolved fraction of contaminants released into the water column, it is necessary to consider the relative potential for each contaminant to change from one phase to another (i.e. contaminant adsorbed to sediment surfaces to dissolved in the water), referred to as the partition coefficient. Partition coefficients describe the ratio between the freely dissolved concentration in water and another environmental phase (e.g. sediment-bound) at equilibrium. It should be noted that desorption rates of contaminants from suspended sediments into the water column are highly regulated by hydrodynamics, biogeochemical processes, and environmental conditions (redox, pH, salinity, and temperature) (Ref 17-38). Due to the variability in environmental conditions, a wide range of partition coefficients are reported in the literature.

17.5.15 There is potential for sediment-bound contaminants to be re-mobilised in the water column following an increase in SSC during the proposed capital dredging. Sediment disturbance will be caused at the bed by abrasion pressure from the dredging equipment (i.e. bucket or draghead). As noted in **Chapter 16: Physical Processes**, maximum SSCs are associated with the disposal activities (with relatively small increases in SSC arising from the dredge itself). Peak excess SSC levels resulting from the disposal activities are predicted, at this preliminary stage, to be around 600 to 800 mg/l at HU060 licensed disposal site (this site is likely to receive the vast majority of the more unconsolidated dredged material, whereas HU056 will be used for any inerodible boulder/glacial clay, see **Chapter 2: The Project**). Increased SSCs arising from the dredge operations will be of lower magnitude and persist for a shorter distance (and time) than that from the disposal. Therefore, while a different activity, the estimated maximum incremental SSC for disposal activities is considered here on a precautionary basis.

17.5.16 A detailed consideration of the potential uplift in contaminant concentrations in the water column following disturbance of contaminated sediments in estuarine

and marine waters cannot be undertaken at this preliminary stage as site-specific sediment sampling and analysis has not yet been completed. However, once the data on sediment contamination has been obtained, a Microsoft Excel Spreadsheet tool developed by APEM Ltd, referred to as SeDiChem, will be used for the assessment in the ES.

17.5.17 However, based on existing evidence on the level of contamination in sediments within the vicinity of the Project (summarised in **Section 17.3**), and the predicted maximum incremental SSC at this preliminary stage (600 to 800 mg/l), the uplift in contaminant concentrations is anticipated to be minimal, and unlikely to present a significant issue at the water body level.

17.5.18 Furthermore, the proposed works will not directly introduce contaminants to the marine environment and good practice measures (Ref 17-34) will be used to prevent/reduce the potential for accidental spillages throughout the dredging process.

17.5.19 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Piling

17.5.20 As discussed for capital dredging above and in **Chapter 16: Physical Processes**, maximum SSCs are associated with the disposal activities. Peak excess SSC levels resulting from the disposal activities are predicted, at this preliminary stage, to be around 600 to 800 mg/l at the HU060 licensed disposal site. Increased SSCs arising from the dredge operations will be of lower magnitude and persist for a shorter distance (and time) than that from the disposal. The anticipated increased SSC concentration related to piling will be less than that of dredging and disposal, as compaction will occur in the sediment rather than complete disturbance. Given this, the proposed piling works are considered unlikely to result in significant water quality impacts from sediment-bound contaminants.

17.5.21 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Disposal activities

17.5.22 As discussed for capital dredging above and in **Chapter 16: Physical Processes** maximum SSCs are associated with the disposal activities. Peak excess SSC levels resulting from the disposal activities are predicted, at this preliminary stage, to be around 600 to 800 mg/l at the HU060 licensed disposal site. Based on existing evidence on the level of contamination in sediments within the vicinity of the Project (summarised in **Section 17.3**), and the precited maximum incremental SSC at this preliminary stage (600 to 800 mg/l), the uplift in contaminant concentrations is anticipated to be minimal during disposal, and unlikely to present a significant issue at the water body level.

17.5.23 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Redistribution of sediment-bound contaminants

Capital dredging

17.5.24 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 bucket/ draghead).

17.5.25 The material within the proposed dredge area is likely to range from coarse sediments (sands and gravel) which are generally unlikely to comprise high contaminant levels due to the material characteristics, to muds, silts and clays which are more typically associated with sediment-bound contaminants. The site-specific sediment sampling and analysis that will be undertaken to inform the ES has not been completed at this preliminary stage. However, based on existing evidence on the level of contamination in sediments within the vicinity of the Project, the overall level of contamination in the proposed dredge area is likely to be low (see **Section 17.3**). Furthermore, sedimentation in relation to the dredging of the berth pocket is predicted to be relatively localised (see **Chapter 16: Physical Processes**). It is, therefore, unlikely that sediment quality will decline elsewhere, as a result of the redistribution and deposition of material during capital dredging.

17.5.26 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Piling

17.5.27 Similar to capital dredging (see above), 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.

17.5.28 However, based on existing evidence on the level of contamination in sediments within the vicinity of the Project, the overall level of contamination in the proposed dredge area is likely to be low (see **Section 17.3**). Furthermore, sedimentation away from the piling locations is predicted to be highly localised (see **Chapter 16: Physical Processes**). It is, therefore, unlikely that sediment quality will decline elsewhere, as a result of the redistribution and deposition of material during piling.

17.5.29 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Disposal activities

17.5.30 The disposal of dredged material at sea associated with the Project will be fulfilled at licensed disposal sites HU056 and HU060 within the Humber Estuary (see **Chapter 2: The Project**).

17.5.31 During the placement of dredged material at the licensed disposal sites, any sediment-bound contaminants within the dredge material will effectively be dispersed and redistributed by the disposal activity. However, based on existing evidence on the level of contamination in sediments within the vicinity of the Project (see **Section 17.3**), it is anticipated that the sediment will be suitable for disposal in the marine environment. It is also noted that disposal site HU060 routinely receives maintenance dredging material from ports within the Humber Estuary. These disposal sites, located within the Humber Estuary, will have similar levels of contamination to the dredge material and therefore disposal activity is not expected to lead to elevated concentrations of contaminants above prevailing background levels.

17.5.32 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Changes to marine water quality from accidental spillages or leaks during construction

17.5.33 Accidental spillages of oil and other substances have the potential to occur during construction from both land and marine-based plant and vessels. Depending on the source, spillages and leaks can potentially introduce contaminants which could reduce marine water quality. A range of best practice pollution prevention guidelines have been outlined in **Section 17.4** and will be followed to minimise the risk of accidental spillages and the risk of introduction of contaminants throughout construction. This not only reduces the potential risk from accidents and spillages/leaks during construction but also outlines the response if were such an event to occur.

17.5.34 Given the low likelihood of this impact occurring and the measures in place to address an incident if one were to occur, the potential impact at this preliminary stage has been assessed as **not significant**. Risks associated with major incidents are considered in **Chapter 22: Major Accidents and Disasters**.

Operation

17.5.35 This section contains an assessment of the potential impacts to water and sediment quality receptors as a result of the operational phase of the Project. The following impact pathways have been assessed:

a. Changes to dissolved oxygen concentrations as a result of increased SSC during the maintenance dredging and disposal activities;

b. Changes to chemical water quality as a result of potential sediment-bound contaminants being released during maintenance dredging and disposal activities; and

c. Redistribution of sediment-bound contaminants during maintenance dredging and disposal activities.

Changes to dissolved oxygen concentrations as a result of increased SSC

Maintenance dredging

17.5.36 Maintenance dredging of the Project berth pocket will be carried out periodically throughout operation if required. The volumes of material from maintenance dredging will be lower than those from the original capital dredge. Furthermore, the density of the newly settled material will be less than that from the consolidated bed dredged during the capital dredge campaign. Rather than a maintenance dredge campaign involving the removal of the full annual maintenance dredge requirement, future maintenance dredge activity will likely involve more frequent smaller individual dredging events (as required for operational requirements of the terminal). As a result, maintenance dredge arisings and disposal will have a notably lower magnitude and the dredged material being deposited will be more dispersive than the impacts described above for the capital works during construction.

17.5.37 The increase in chemical and biological oxygen demand associated with elevated SSC in the water column during maintenance dredging may have the potential to reduce dissolved oxygen concentrations. The material within the proposed dredge area is likely to range from coarse sediments (sands and gravel) which are unlikely to influence dissolved oxygen concentrations, to clays including alluvium deposits for which organic content can result in reduced dissolved oxygen concentrations. That said, it should be noted that the material to be removed during the maintenance dredging campaign will have been recently deposited and in reduced volumes compared to the capital dredge. Furthermore, the majority of material disturbed during maintenance dredging works will be lifted from the bed to the hopper, with only a small proportion raised into suspension and remaining in the water column (i.e., through abrasion pressure from the bucket/ draghead).

17.5.38 The dredge area is situated within the Humber Lower transitional water body. The physico-chemical quality element ‘Dissolved oxygen’ is currently, based on the 2019 interim classification, at high status for this water body, despite the area being subject to regular disturbance from dredging. It is, therefore, considered unlikely that dissolved oxygen concentrations will fall below the standards set under the WFD as a result of the proposed maintenance dredging.

17.5.39 Numerical modelling of the capital dredge has shown that increases in SSC will be short-term and localised to the dredging activity and therefore as the maintenance dredging volumes are smaller the change in SSC would be lower than that of the capital dredge (see **Chapter 16: Physical Processes**). It is anticipated that any reduction in dissolved oxygen concentration will be short-lived and replenished over the subsequent tidal cycle. Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Disposal activities

17.5.40 Volumes of material from maintenance dredging of the Project berth pocket will be lower than those from the original capital dredge. Whilst the overall

maintenance dredge volume will increase slightly as a result of the Project, the amount will not exceed the current overall annual licenced volume for Immingham. Of particular importance in relation to potential effects, the frequency and volume of material deposited from each load will not change compared with current maintenance dredging activities as the same plant and methods are proposed to be used. Future disposal of maintenance dredge arisings will, therefore, result in the same changes in SSC within the disposal plumes as existing maintenance dredging activities undertaken for the port.

17.5.41 During operation the disposal of dredged material (which would be sand/silt (alluvium)) at sea associated with the Project will be fulfilled at licensed disposal site HU060 (see **Chapter 2: The Project**).

17.5.42 During the placement of dredged material at the Clay Huts licensed disposal site (HU060), the potential for reduction in dissolved oxygen concentrations in the water column is considered to be low. Any changes would be localised and short-lived given the dynamic nature of the site, which would rapidly be re-oxygenated. HU060 is located within the Lower Humber water body for which the physico-chemical quality element 'Dissolved oxygen' is currently, based on the 2019 interim classification, at high status, despite routinely receiving maintenance dredging material from ports within the Humber Estuary. It should be noted that material to be disposed during the maintenance dredging campaign would be recently deposited and in reduced volumes compared to the capital dredge.

17.5.43 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Changes to chemical water quality as a result of potential sediment-bound contaminants

Maintenance dredging

17.5.44 As discussed for capital dredging above, the proposed maintenance dredging activities are considered unlikely to result in significant water quality impacts. The level of contamination of the material that will be removed through maintenance dredging is anticipated to be similar to the existing surficial sediment samples collected within the vicinity of the Project (see **Section 17.3**). Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Disposal activities

17.5.45 As discussed for the proposed disposal of capital dredge material above, the proposed disposal activities for maintenance dredging are considered unlikely to result in significant water quality impacts. Maximum SSCs are associated with the disposal activities and peak excess SSC levels resulting from the disposal activities are predicted, at this preliminary stage, to be around 600 to 800 mg/l at the HU060 licensed disposal site. The level of contamination of the material that will be removed through maintenance dredging is anticipated to be similar to the existing surficial sediment samples collected within the vicinity of the Project (see

Section 17.3). It should also be noted that this disposal site is already used and has been used by the Port of Immingham for the disposal of maintenance dredge material for over 30 years.

17.5.46 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Redistribution of sediment-bound contaminants

Maintenance dredging

17.5.47 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.

17.5.48 The material within the proposed dredge area is likely to range from coarse sediments (sands and gravel) which are generally unlikely to comprise high contaminant levels, to muds, silts and clays which are more typically associated with sediment-bound contaminants. The level of contamination of the material that will be removed through maintenance dredging is anticipated to be similar to the existing surficial sediment samples collected within the vicinity of the Project (see **Section 17.3**). Furthermore, sedimentation in relation to dredging of the berth pocket is predicted to be relatively localised (see **Chapter 16: Physical Processes**). It is, therefore, unlikely that sediment quality will decline elsewhere, as a result of the redistribution of material during maintenance dredging. In addition, maintenance dredging of the Project berths will be carried out in line with the existing regime across the Port which requires regular sediment sampling and testing to ensure the material remains suitable for disposal at sea.

17.5.49 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

Disposal activities

17.5.50 The disposal of maintenance dredged material at sea associated with the Project will be fulfilled at licensed disposal site HU060 (see **Chapter 2: The Project**).

17.5.51 During the placement of dredged material at the Clay Huts licensed disposal site (HU060), any sediment-bound contaminants within the dredge material will effectively be redistributed by the disposal activity. As discussed in the preceding sections, material types more typically associated with sediment-bound contaminants are muds, silts and clays. Material removed during the maintenance dredging campaign would be recently deposited alluvium and in reduced volumes compared to the capital dredge. Existing sediment sampling data in the vicinity of the Project generally showed low levels of contaminant concentrations within surficial sediments. The proposed HU060 licensed disposal site has received maintenance dredge arisings from the Port of Immingham (and other ports within the Humber Estuary) for more than 30 years and periodic sediment sampling to assess the suitability for disposal at sea will continue in accordance with the conditions of the Port's existing maintenance dredge licences. This will ensure the material remains suitable for disposal at sea.

17.5.52 Based on the available information provided above, the potential impact at this preliminary stage has been assessed as **not significant**.

17.6 Preliminary Assessment of Residual Effects

17.6.1 The following sections summarise the likely effects on Marine Water and Sediment Quality receptors.

Construction

17.6.2 The assessment considered three impact pathways in detail during construction as a result of the capital dredging, piling and disposal activities. These addressed the potential for impacts as a result of the potential changes to dissolved oxygen concentrations, changes to chemical water quality as a result of potential sediment-bound contaminants, and redistribution of sediment-bound contaminants.

17.6.3 All of the potential impacts on water and sediment quality receptors during construction were, at this preliminary stage, assessed as not significant. Given this, no specific mitigation measures have been identified as being likely to be required, and residual effects remain unchanged. However, standard mitigation measures will be undertaken to manage commonly occurring environmental effects. As noted in **Section 17.4**, an Outline CEMP will be drafted and submitted with the DCO application and the measures finalised in the CEMP which will set out in full the mitigation measures needed to manage environmental effects and which will be implemented prior to works commencing and during works as relevant.

17.6.4 The final outcomes of the assessment of impacts and the conclusion in respect of the likely significant effects of the Project on Marine Water and Sediment Quality will be reported within the ES.

Operation

17.6.5 The assessment considered three impact pathways in detail during operation as a result of maintenance dredging and disposal activities. These addressed the potential for impacts as a result of the potential changes to dissolved oxygen concentrations, changes to chemical water quality as a result of potential sediment-bound contaminants, and redistribution of sediment-bound contaminants.

17.6.6 As for impacts during construction, all of the potential impacts on water and sediment quality receptors during operation were, at this preliminary stage, assessed as not significant. Given this, no specific mitigation measures have been identified as being likely to be required, and residual effects remain unchanged. However, standard mitigation measures will be undertaken to manage commonly occurring environmental effects.

Decommissioning

17.6.7 The Project DCO would not make any provision for the decommissioning of the marine infrastructure above and below water level. This is because the

development would, once constructed, become part of the fabric of the Immingham port estate and would, in simple terms, continue to be maintained so that it can be used for port related activities to meet a long-term need. On this basis, potential effects on marine water and sediment quality receptors from decommissioning have been scoped out.

17.7 Summary of Preliminary Assessment

17.7.1 A summary of the impact pathways that have been assessed at this preliminary stage, together with the identified residual impacts and level of confidence is presented in **Table 17.4**.

Table 17.4 Summary of potential impact, mitigation measures and residual impacts

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Effect	Confidence
Construction Phase					
Marine water and sediment quality	Changes to dissolved oxygen concentrations as a result of increased SSC during piling, capital dredging and disposal activities	Not significant	N/A	Not significant	Medium
	Changes to chemical water quality as a result of potential sediment-bound contaminants being released during piling, capital dredging and disposal activities	Not significant	N/A	Not significant	Medium
	Redistribution of sediment-bound contaminants during piling, capital dredging and disposal activities	Not significant	N/A	Not significant	Medium
	Changes to marine water quality from accidental spillages of leaks	Not significant	N/A	Not significant	High
Operational Phase					
Marine water and sediment quality	Changes to dissolved oxygen concentrations as a result of increased SSC during the maintenance dredging and disposal activities	Not significant	N/A	Not significant	Medium
	Changes to chemical water quality as a result of potential contaminants in the seabed sediment being released during maintenance dredging and disposal activities	Not significant	N/A	Not significant	Medium
	Redistribution of sediment-bound contaminants during maintenance dredging and disposal activities	Not significant	N/A	Not significant	Medium

17.8 References

Ref 17-1 Institute of Environmental Management and Assessment. (2016). Environmental Impact Assessment Guide to: Delivering Quality Development.

Ref 17-2 Chartered Institute of Ecology and Environmental Management. (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland. Available at: https://cieem.net/wp-content/uploads/2018/08/ECIA-Guidelines-2018-Terrestrial-Freshwater-Coastal-and-Marine-V1.1Update.pdf

Ref 17-3 European Commission (2000). Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

Ref 17-4 European Commission (2008). Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy, amending and subsequently repealing Council Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC, 86/280/EEC and amending Directive 2000/60/EC of the European Parliament and of the Council.

Ref 17-5 European Commission (2006). Directive 2006/7/EC of the European Parliament and of the Council of 15 February 2006 concerning the management of bathing water quality and repealing Directive 76/160/EEC.

Ref 17-6 European Commission (1991a). Council Directive of 12 December 1991 concerning protection of waters against pollution caused by nitrates from agricultural sources (91/676/EEC).

Ref 17-7 European Commission (1991b). Council Directive of 21 May 1991 concerning urban waste water treatment (91/271/EEC).

Ref 17-8 The Stationery Office Limited (2009). Marine and Coastal Access Act 2009.

Ref 17-9 The Stationery Office Limited (2008). Planning Act 2008.

Ref 17-10 The Stationery Office (2017a). Statutory Instrument 2017 No. 407. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.

Ref 17-11 The Stationery Office Limited (2015). WFD (Standards and Classification) Directions (England and Wales) 2015.

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Ref 17-13 The Stationery Office Limited (2015). 2015 No. 668 The Nitrate Pollution Prevention Regulations 2015.

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17.9 Abbreviations and Glossary of Terms

Table 17.5 Glossary and Abbreviations

Term	Acronym	Meaning
Appropriate Assessment	AA	The assessment of the impact on the integrity of a European site of a project or plan, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives.
Associated British Ports	ABP	One of the UK's leading and best-connected ports groups, owning and operating 21 ports across England, Wales and Scotland.
Action Level	AL	Cefas Guideline Action Levels are used as part of a 'weight of evidence' approach to assessing material suitability for disposal at sea.
Centre for Environment, Fisheries and Aquaculture Science	Cefas	The Centre for Environment, Fisheries and Aquaculture Science is an executive agency of the United Kingdom Government Department for Environment, Food and Rural Affairs.
Construction Environmental Management Plan	CEMP	A Construction Environmental Management Plan describes the specific mitigation measures to be followed by the appointed construction contractor to reduce potential nuisance impacts.
Chartered Institute of Ecology and Environmental Management	CIEEM	The leading professional membership body representing and supporting ecologists and environmental managers in the UK, Ireland and abroad.
Candidate Special Area of Conservation	cSAC	A site proposed for designation under EU legislation for the protection of habitats and species considered to be of European interest.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Department for Environment, Food and Rural Affairs	Defra	The Government department responsible for policy and regulations on environmental, food and rural issues. The department's priorities are to grow the rural economy, improve the environment and safeguard animal and plant health.
Exclusive Economic Zone	EEZ	-An area of coastal water and seabed within a certain distance of a country's coastline, to which the country claims exclusive rights for fishing, drilling, and other economic activities.

Term	Acronym	Meaning
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.
Environmental Quality Standards	EQS	The maximum permissible concentration of a potentially hazardous chemical.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
European Union	EU	An economic and political union of 28 countries which operates an internal (or single) market which allows the free movement of goods, capital, services and people between member states.
Guidance for Pollution Prevention	GPP	GPPs provide environmental good practice guidance for the whole of the UK.-
Heavily Modified Water Body	HMWB	Significant water bodies that have changed water category due to modifications.
Habitats Regulations Assessment	HRA	An assessment of projects (or plans) potentially affecting European Sites in the UK, required under the Habitats Directive and Regulations. Also known as an assessment of implications on European Sites.
Institute of Environmental Management and Assessment	IEMA	A professional body for practitioners working in the fields of environmental management and assessment.
Immingham Outer Harbour	IOH	Immingham Outer Harbour is an area which partly makes up infrastructure located at the Port of Immingham.
Likely Significant Effect	LSE	Schedule 4 of the Regulations requires an environmental statement to include a description of the likely significant effects of the development on the environment.
Maximum Allowable Concentrations	MAC	The threshold limit value of a pollutant, not to be exceeded. The threshold is based off dose-response effects of human or animal exposure for each substance.
Marine and Coastal Access Act 2009	MCAA	The Act introduces a new system of marine management. This includes a new marine planning system, which makes provision for a statement of the Government's general policies, and the general policies of each of the developed administrations, for the marine environment, and also for marine plans which will set out in more detail what is to happen in the different parts of the areas to which they relate.
Mean High Water Springs	MHWS	The height of Mean Water High Springs is the average throughout the year, of two successive high waters, during a

Term	Acronym	Meaning
		24-hour period in each month when the range of the tide is at its greatest.
Marine Management Organisation	MMO	The Marine Management Organisation is an executive non-departmental public body in the United Kingdom established under the Marine and Coastal Access Act 2009, with responsibility for English waters.
Marine Policy Statement	MPS	The UK Marine Policy Statement provides the framework for preparing Marine Plans and is key when making decisions directly affecting the marine environment.
National Policy Statement for Ports	NPSfP	The National Policy Statement for Ports provides the framework for decisions on proposals for new port development.
Nationally Significant Infrastructure Projects	NSIP	A type of project listed in the Planning Act 2008, which must be consented by a Development Consent Order.
Nitrate Vulnerable Zone	NVZ	Areas covering 62% of England designated as a result of the EU's Nitrates Directive in order to reduce the level of nitrates in surface and groundwater. Farmers with land in nitrate vulnerable zones have to follow mandatory rules to tackle nitrate loss from agriculture.
Organochlorine pesticides	OCP	Organochlorine pesticides are chlorinated hydrocarbons used extensively from the 1940s through the 1960s in agriculture and mosquito control
Polycyclic Aromatic Hydrocarbons	PAH	A polycyclic aromatic hydrocarbon is a chemical compound containing only carbon and hydrogen that is composed of multiple aromatic rings.
Polybrominated Diphenyl Ethers	PBDE	Polybrominated diphenyl ethers are a group of man-made organobromine compounds.
Preliminary Environmental Information Report	PEI Report	A report that compiles and presents the Preliminary Environmental Information gathered for a project.
Perfluorooctane Sulphonate	PFOS	Perfluorooctane sulfonate belongs to a large, diverse group of man-made substances known collectively as perfluoroalkyl and polyfluoroalkyl substances.
Planning Inspectorate	PINS	An executive agency with responsibilities for planning appeals, national infrastructure planning applications, local plan examinations and other planning-related casework in England and Wales.
Planning Practice Guidance	PPG	A series of guidance documents which support the content of the National Planning Policy Framework.

Term	Acronym	Meaning
Particle Size Analysis	PSA	Particle size analysis is used to characterise the size distribution of particles in a given sample.
Potential Special Protection Area	pSPA	-
River Basin Management Plan	RBMP	A regional plan that sets out how organisations, stakeholders and communities would work together to improve the water environment and fulfil the requirements of the Water Framework Directive.
Special Area of Conservation	SAC	A designated area protecting habitats and species identified in Annexes I and II of the Habitats Directive
Special Protection Area	SPA	A designated area protecting one or more rare, threatened, or vulnerable bird species listed in Annex I of the Birds Directive
Source Protection Zone	SPZ	Zones defined by the Environment Agency to protect groundwater sources such as wells, boreholes and springs from potential contamination.
Suspended Sediment Concentrations	SSC	Suspended sediment concentration is the total value of both mineral and organic material carried in suspension by a river.
Tributyl Tin	TBT	Umbrella term for a class of organotin compounds which contain the $_3$Sn group.
Trailing Suction Hopper Dredger	TSHD	Trailing Suction Hopper Dredgers are oceangoing vessels that can collect sand and silt from the seabed and transport it over large distances.
United Kingdom	UK	-
Water Framework Directive	WFD	A European Union Directive which commits member states to achieve good status of all waterbodies (both surface and groundwater), and also requires that no such waterbodies experience deterioration in status. Good status is a function of good ecological and good chemical status, defined by a number of elements.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage

Associated British Ports

Document History

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Table of contents

Tables

18 Water Quality, Coastal Protection, Flood Risk and Drainage

18.1 Introduction

18.1.1 This chapter presents the preliminary findings of the assessment of the likely effects of the Project on water quality, coastal protection, flood risk and drainage. This chapter sets out the assessment methodology used, the datasets used to inform the assessment, an outline of baseline conditions, and sets out the likely significant effects the Project will have upon local conditions.

18.1.2 There are interrelationships related to the Project's potential effects on water quality, coastal protection, flood risk and drainage and other disciplines. Therefore, reference should also be made to the following chapters:

a. **Chapter 9: Nature Conservation (Marine Ecology)**.

b. **Chapter 16: Physical Processes**.

c. **Chapter 17: Marine Water and Sediment Quality**.

d. **Chapter 19: Climate Change**.

e. **Chapter 21: Ground Conditions and Land Quality**.

18.1.3 This chapter is also supported by the following figures:

a. **Figure 18.1: Study Area** (PEI Report, Volume III).

b. **Figure 18.2: Environment Agency Flood Map for Planning** (PEI Report Volume III).

18.2 Approach to Assessment

Scope and Methods

18.2.1 A scoping exercise was undertaken in August 2022 to establish the form and nature of the water quality, coastal protection, flood risk and drainage assessment, and the approach and methods to be followed.

18.2.2 The Scoping Report (**Appendix 1.A** of PEI Report, Volume IV) records the findings of the exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on water quality, coastal protection, flood risk and drainage.

18.2.3 Following receipt of the Scoping Opinion (**Appendix 1.B** of PEI Report, Volume IV) regarding the information to be provided in the Environmental Statement (ES) the following approach has been agreed with the Planning Inspectorate and statutory consultees which has been taken into account as part of the ongoing water quality, coastal protection, flood risk and drainage assessment.

Table 18.1 Scoping Opinion comments on water quality, coastal protection, flood risk and drainage

Consultee	Summary of Response	How comments have been addressed in this chapter
Environment Agency	Paragraph 17.2.14 considers that the residual risk from overtopping or failure of defences is low and as a result, the potential impacts of this are given little weight in the remainder of the Report. The flood risk assessment will need to recognise that the probability of defence failure is not suitable for planning purposes; we would refer the Applicant to paragraph 024 of the recently updated Planning Practice Guidance (Flood risk and coastal change section) for further information on what is required in this respect. To help with considering the residual risk the Environment Agency has produced Coastal Hazard Mapping which covers the site (this is not referenced as a data source in paragraph 17.2.1). To obtain this information the Applicant is advised to make a formal enquiry to our Customers and Engagement team at LNenquiries@environment-agency.gov.uk. Please request a Product 3/8. There is no charge for this information. COMAH regulated sites are expected to consider the level of flood risk and appropriate resilience. This is set out in the Inspection of COMAH Operator Flood Preparedness delivery guide. The delivery of this is not specifically required within the EIA for planning purposes, but it will need to be considered as part of the pre-operation Safety Report. As such, it would be prudent to consider this alongside planning guidance on flood risk so that any additional mitigation standards, which may be required during site operation (e.g. for the storage of hazardous substances), can be included from the outset. Although physical processes are considered in Chapter 17, we would also like to see a discussion (or cross-reference to any discussion in Chapter 15) regarding geomorphology resulting from said processes	This will be addressed in the Flood Risk Assessment (FRA) which will accompany the DCO applicable and be referenced by the ES. Existing flood risk issues are considered in **Section 18.4** and potential impacts detailed in **Section 18.7**.
Anglian Water	There are significant existing Anglian Water assets including water mains along the south side of the site and within the roads to the north and east. Water recycling assets including rising mains also run to the south, east	Noted.

Consultee	Summary of Response	How comments have been addressed in this chapter
	and north of the site. Maps of Anglian Water's assets are available to view at: www.digdat.co.uk	
Anglian Water	Anglian Water notes that the promoter identifies at Page 211 that surface water on site is managed by the Port of Immingham (17.2.21). We conclude from this that no surface water will be managed via the Anglian Water public sewer network. At 17.2.3 the promoter comments on the proximity of an Anglian Water 600mm foul sewer in proximity to the site boundary. The rising main on the southern edge of the site is 450mm, the sewers to the north and east of 300mm with connections of 150mm. These assets are part of and serve the wider Immingham Water Recycling catchment including the town of Immingham to the west.	Noted.
Anglian Water	We note that other than a reference to a 'main water pipe' (2.2.7) the promoter does not refer to the water supply network assets which run along Kings Road, Queens Road and the southern boundary of the site. Through consultation proposed in 17.7.1 Anglian Water would want to ensure the location and nature of these assets is identified and protected. To reduce the need for diversions and the attendant carbon impacts of those works, ground investigation would enable the promoter to design out these potential impacts and so also reduce the potential impact on services if construction works cause a pipe burst or damage to supporting infrastructure. This approach would accord with Project Objective C. at 2.4.2. The Scoping Report refers to Anglian Water assets and that: • the project relies upon a connection to the 'local sewer network' (21.4.7), • a potable water supply connection is required to a 'local main water network' (2.4.20) • a 'site wide cooling water system' is required (2.4.22) In view of the guidance in the National Policy Statements we would have anticipated that the scoping would have included and then considered the approach to water supply, water resources and water recycling assets.	The presence of Anglian Water assets has been noted and this information will be used to inform Project planning and design. Anglian Water will be contacted to discuss the requirements for potable water on the Site once the water volumes needed are defined.

Consultee	Summary of Response	How comments have been addressed in this chapter
	Anglian Water requests that these points are assessed early in the EIA to set out how the project will be supplied with water, its wastewater managed, how water assets serving residents and business will be protected and how design has been altered to reduce the need for new water infrastructure or the diversion of existing assets.	
Anglian Water	We support the inclusion of water (17.5.3) including water infrastructure in the Construction Environment Management Plan and Water Management Plan. The CEMP and a WMP should include steps to remove the risk of damage to Anglian Water assets from plant and machinery including haul roads. Further advice on minimising and then relocating Anglian Water existing assets can be obtained from: connections@anglianwater.co.uk	This information is noted.
Anglian Water	The site is in the East Lincolnshire Water Resource Zone (WRZ), which supplies water to Grimsby the eastern parts of Lincolnshire WRZ and serves communities as far south as Boston. We note that whilst the scoping considers water environment impacts it does not look at water resources. As the site is within an area of 'serious water stress' designated by the Environment Agency and water is used in the project construction and operation this indicates that water resources should be assessed in the EIA, learning lessons from previous projects such as Sizewell C. This may include consideration of the Socio- Economic effects of the use of water for the project in the context of growth and climate change as well the potential impacts on communities and business if these services are distributed. There is no reference to assessment of the carbon costs of relocating water infrastructure if assets are impacted during construction or operation. Anglian Water notes that the applicant has not sought to scope these matters out by providing sufficient information to reach a conclusion that the projects impact regarding water supply as well as water recycling and water quality, are not significant.	Water requirements will be discussed with Anglian Water in order to determine Project impacts on local water resources. Potential Project impacts will be reported in the ES.

Consultee	Summary of Response	How comments have been addressed in this chapter
Anglian Water	Anglian Water would welcome the instigation of discussions with Associated British Ports as the prospective applicant, in line with the requirements of the 2008 Planning Act and guidance. Experience has shown that early engagement and agreement is required between NSIP applicants and statutory undertakers during design and assessment and well before submission of the draft DCO for examination. Consultation at the statutory PEIR stage would in our view be too late to inform design and may result in delays to the project. We would recommend discussion on the following issues: 1. Requirement for potable and raw water supplies 2. Impact of development on Anglian Water's assets including groundwater and water abstraction and the need for mitigation 3. Requirement for water recycling connections 4. The design of the project to minimise interaction with Anglian Water assets and specifically to avoid the need for diversions which have carbon costs 5. Confirmation of the project's cumulative impacts (if any) with Anglian Water projects 6. Draft Protective Provisions	The Applicant will consult with Anglian Water on this matter.
Planning Inspectorate	Paragraph 17.2.14 considers that the residual risk from overtopping or failure of defences is low. The Applicant's attention is drawn to the Environment Agency's consultation response and paragraph 024 of the Planning Practice Guidance (Flood risk and coastal change) which states that information on the probability of flood defence failure is unsuitable for planning purposes given the substantial uncertainties involved in such long-term predictions. The Applicant is advised to use the Environment Agency Coastal Hazard Mapping when considering residual flood risk and agree the detailed flood risk methodology and mitigation with the Environment Agency where possible.	This will be addressed in the FRA which will accompany the DCO application and be referenced in the ES.

Consultee	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	Paragraph 17.2.5 notes that tide-locking is an existing problem for Habrough Marsh Drain and North Beck Drain. The Inspectorate draws attention to concerns within the consultation response from North East Lindsey Drainage Board that offshore infrastructure in proximity to the gravity outfall of Habrough Marsh Drain could impede drainage. The ES should consider any likely impacts arising from the construction and operation of the offshore infrastructure on the function of drains outfalls and implications for flood risk onshore.	This will be addressed in the FRA which will accompany the DCO Application and be referenced by the ES.
North East Lindsey Drainage Board	The onshore part of the site is within the North East Lindsey Drainage Board area. Generally, the report contains appropriate references to North East Lindsey Drainage Board and the Board has already provided information to the consultants. An area of concern is the impact off shore. The proposals show new infrastructure in the Humber near to the gravity outfall of Habrough Marsh Drain, there is concern that this will result in siltation which will impede the discharge. The FRA should address this and put in place measures to mitigate it.	This will be addressed in the FRA which will accompany the DCO Application and be referenced by the ES.

Legislation, Policy and Guidance

18.2.4 **Table 18.2** presents the legislation, policy and guidance relevant to the water quality, coastal protection, flood risk and drainage assessment and details how their requirements will be met by the Project.

Table 18.2 Relevant legislation, policy and guidance regarding Water Quality, Coastal Protection, Flood Risk and Drainage

Legislation/ Policy/ Guidance	Consideration within the PEI Report
The Water Act 2014 (Ref 18-27)	
The aim of the Act was to reform the water industry to make it more innovative and responsive to customers and to increase the resilience of water supplies to natural hazards such as droughts and floods. The Act describes provisions for the following: abstraction water license modifications, waterworks records, flood insurance for households, internal drainage boards, regulations for the water environment and Regional Flood and Coastal Committees.	Abstractions located within 1km radius of the Site boundary are described in **Paragraph 18.3.3**.
The Floods and Water Management Act 2010 (Ref 18-31)	
The aim of the Act was to make provision about water, including provision about the management of risks in connection with flooding and coastal erosion.	Flood risks associated with Project will be investigated in the FRA to be submitted with the DCO application. Baseline flood risks are described in **Section 18.4**.
The Land Drainage Act 1991 (as amended) (Ref 18-32)	
The aim of the Act was to reform the water industry to make it more innovative and responsive to customers and to increase the resilience of water supplies to natural hazards such as droughts and floods. The Act describes provisions for the following: abstraction water license modifications, waterworks records, flood insurance for households, internal drainage boards, regulations for the water environment and Regional Flood and Coastal Committees.	Abstractions located within a 1km radius of Site boundary are described in **Paragraph 18.3.3**. Flood risks associated with Project will be investigated in the FRA to be submitted with the DCO application.
The Water Resources Act 1991 (Ref 18-26)	
Previously under the Water Resources Act 1991 and now under the *Environmental Permitting (England and Wales) Regulations 2016 (as amended)* it is an offence for a person to cause or knowingly permit pollution of controlled waters The Act provides a framework for the application of environmental permits as well as receiving, varying, transferring and surrendering permits and compliance/enforcement of permits.	Controlled waters are discussed in **Paragraph 18.4**. Potential impacts upon controlled waters are discussed in **Sections 18.5** and **18.7**.

Legislation/ Policy/ Guidance	Consideration within the PEI Report
The Salmon and Freshwater Fisheries Act 1975 as amended (Ref 18-33)	
The Act is a law passed by the government of the United Kingdom in 1975 in an attempt to protect salmon and trout from commercial poaching, to protect migration routes, to prevent wilful vandalism and neglect of fisheries, ensure correct licensing and water authority approval.	The mitigation measures are detailed in **Section 18.5** and aim to protect salmon and freshwater fisheries within the Humber estuary.
The Environmental Permitting (England and Wales) Regulations 2016 (Ref 18-25)	
The Regulations set out the measures for those carrying out activities that may cause imminent threats of, or actual 'environmental damage', which require a permit. These Regulations also outline the authorities responsible for enforcing the Regulations. Such Regulations cover environmental permits, discharge into regulated facilities, enforcement and offences, public registers and powers/functions of the regulator and authority.	**Section 18.5** provides details of mitigation measures that aim to prevent environmental damage.
The Environmental Damage (Prevention and Remediation) Regulations 2015 (Ref 18-34)	
The Regulations concern the prevention and remediation of environmental damage to: (a) protected species or natural habitats, or a site of special scientific interest, (b) surface water or groundwater, or (c) land, as specified in regulation 4. They implement Directive 2004/35/EC of the European Parliament and of the Council on environmental liability with regard to the prevention and remedying of environmental damage.	Protected habitats and water bodies are discussed in **Section 18.4**. Potential impacts are discussed in **Sections 18.6** and **18.7**, whilst mitigation measures are detailed in **Section 18.5**.
The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015 & 2017 (Ref 18-35)	
The principal objective of the framework is for all groundwater, surface water and coastal water bodies to achieve 'good' status by 2015 and maintain this status. It includes broader ecological objectives as well as aims to prevent deterioration of all water bodies. The framework aims to develop sustainable water use and reduce and eliminate the presence of hazardous substances within water bodies. It must be considered in any scheme that has the potential to have an impact on any part of the water environment. This is incorporated in The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.	Water Framework Directive (WFD) surface water and groundwater bodies are described in **Section 18.4** and **Table 18.5**. Potential impacts to WFD surface water bodies are outlined in **Section18.7**.
The Eels (England and Wales) Regulations 2009 (Ref 18-36)	
The Regulations implement in England and Wales Council Regulation (EC) No 1100/2007 establishing measures for the recovery of the stock of European eel. They require holders of licences to fish for eels other than by rod and line to submit eel catch returns to record information	The Eel regulations will be used to inform any potential abstractions impacts from the Humber Estuary and any

Legislation/ Policy/ Guidance	Consideration within the PEI Report
relating to eels caught of 12cm or less in length and aquaculture production business operators to keep records of eels of less than 12cm received. Eels from or to England or Wales must be accompanied by a certificate identifying the origin of the eels and that eels for export were caught in a manner consistent with the relevant eel management. The Regulations further provide for close seasons, the free passage of eels and enforcement.	alterations made to inlets found within the Project boundary. Eel catches were recorded in the Environment Agency's fish data explorer for the Humber as considered in **Section 18.4**.
The Groundwater (England and Wales) Regulations 2009 (Ref 18-37)	
The Regulations implement in England and Wales Community legislation on pollution of groundwater. They provide rules for the granting by the Environment Agency of a permit under these Regulations, consent under section 91(8) of the Water Resources Act 1991 and (with exceptions) an environmental permit under the Environmental Permitting (England and Wales) Regulations. In addition, the Regulations create an offence of discharge of a hazardous substance or non-hazardous pollutant without a permit, provide for powers of enforcement of the Environment Agency and prescribe penalties for offences committed under these Regulations.	Potential impacts associated with the discharge of a hazardous substances or non-hazardous substances are considered in **Section 18.7**.
The Control of Pollution (Oil Storage) (England) Regulations 2001 (Ref 18-38)	
The Regulations require a person having custody or control of oil to carry out certain works and take certain precautions and other steps for preventing pollution of any waters which are controlled waters for the purposes of Part III of the Water Resources Act 1991. Regulation 2(2) sets out circumstances in which these Regulations do not apply to the storage of oil. Regulation 3 imposes general requirements in relation to the storage of oil. Additional requirements which apply to specific types of container are imposed by regulation 4 and regulation 5. Regulation 6 contains transitional provisions. Where in a transitional case the Environment Agency considers that there is a significant risk of pollution of controlled waters from the oil in question it has the power to serve a notice on the person having custody or control to minimise the risk (see reg.7).	Controlled waters are discussed in **Section 18.4**, whilst potential risks to controlled waters are discussed in **Section 18.7**.
The Floods and Water (Amendment etc) (EU Exit) Regulations 2019	
Draft regulation laid before Parliament to the European Union (withdrawal) Act 2018, for approval by resolution of each House of Parliament to come into force on exit day	Continuity legislation – see above.
National Policy Statement for Ports (NPSfP) (Ref 18-9)	
The NPSfP is a framework to address proposals for port development in the UK and associated development (rail and road). This describes the UK Government's conclusions on new port infrastructure in the context of future demand, needs and the current economy. The Project	NPSfP requirements are being used to establish the impact of the Project on the water environment – refer to

Legislation/ Policy/ Guidance	Consideration within the PEI Report
is considered to be a Nationally Significant Infrastructure Project (NSIP) within the ports industry. The aims of the NPSfP for development and flood risk are to ensure that flood risk from all sources of flooding is taken into account at all stages in the planning process, to avoid inappropriate development in areas at risk of flooding and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, including 'water compatible' development, the policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall. Port development is defined as being water compatible development and, therefore, acceptable in high flood risk areas (Paragraph 5.2.3). The NPSfP state*s "all applications for port development of 1 hectare or greater in Flood Zone 1 and all proposals for projects located in Flood Zones 2 and 3 should be accompanied by a flood risk assessment (FRA). This should identify and assess the risks of all forms of flooding to and from the project and demonstrate how these flood risks will be managed, taking climate change into account*" (Paragraph 5.2.4). The NPSfP notes that the latest set of UK Climate Projections should be used in assessments to ensure the appropriate adaptation measures have been identified. "A*pplicants should apply, as a minimum, the emissions scenario that the independent Committee on Climate Change suggests the world is currently most closely following – and the 10%, 50% and 90% estimate ranges. These results should be considered alongside relevant research which is based on the climate change projections such as Environment Agency Flood Maps*" (Paragraph 4.13.7). Paragraph 5.2.18 of the NPSfP states "T*he Government's view is that there is no 'public good' need, on national resilience grounds, to require a higher specification than will secure commercial resilience of the individual facility, notwithstanding that some types of severe weather may effect ports in a region or along a particular stretch of coastline, for example from a storm surge. The NPSfP provides more generally for resilience and diversity of ports provision. Applicants will be in the best position to make a commercial judgement on the required appropriate adaptation measures to reduce the risk from long term climate change as it affects their own facilities*". In Section 5.6 of NPSfP it states that "Infrastructure development can have adverse effects on the water environment, including groundwater, inland surface water, transitional waters and coastal waters. During the construction, operation and decommissioning phases, it can lead to increased demand for water, involve discharges to water and cause adverse ecological effects resulting from physical modifications to the water environment." The consideration of these effects in terms of water bodies failing to meet environmental objectives established under WFD legislation will be necessary.	**Section 18.7**. The FRA which will accompany the DCO application will be undertaken in line with applicable policy requirements.
National Planning Policy Framework (NPPF) (18-39)	

Legislation/ Policy/ Guidance	Consideration within the PEI Report
The NPPF sets out the government's planning policies and how these are expected to be applied. The NPPF states that "*when determining planning applications, LPA's should ensure that flood risk is not increased elsewhere (…) where appropriate, applications should be supported by a site-specific Flood Risk Assessment*". "*Strategic policies should set out an overall strategy for the pattern, scale and quality of development, and make sufficient provision for: …(d) conservation and enhancement of the natural, built and historic environment*…". This includes landscapes and green infrastructure, and planning measures to address climate change mitigation and adaptation (paragraph 20d). "*Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts*…". Development should not cause unacceptable levels of water pollution and should help improve water quality wherever possible (paragraph 153). "*Planning policies and decisions should contribute to and enhance the natural and local environment by: … (e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as water quality, taking into account relevant information such as river basin management plans …*" (paragraph 174e).	The impact of the Project on the water environment of the NPPF will be detailed in the ES and in the supporting FRA. **Section 18.7** provides a preliminary assessment of water environment effects.
National Planning Practice Guidance (NPPG) (Ref 18-10)	
The NPPG provides guidance for local planning authorities on assessing the significance of water environment effects of proposed developments. The guidance highlights that adequate water and wastewater infrastructure is needed to support sustainable development.	This guidance has been considered within **Section 18.7** when establishing the potential effects of the Project on the local aquatic environment and ensuring the sustainability of the development.
Flood Risk and Coastal Change NPPG (18-40)	
The Flood Risk and Coastal Change NPPG recommends that "*Local Plans should apply a sequential, risk-based approach to the location of development to avoid where possible flood risk to public and property and manage any residual risk, taking account of the impacts of climate change, by:* • *Applying the Sequential Test;*	The NPPG provides general guidance on flood risks which will be taken into account in the ES and the supporting FRA. **Section 18.7** provides

Legislation/ Policy/ Guidance	Consideration within the PEI Report
• *Applying the Exception Test if necessary;* • *Safeguarding land from development that is required for current and future flood management;* • *Using opportunities offered by new development to reduce the causes and impacts of flooding; and* • *Where climate change is expected to increase flood risk, seeking opportunities to facilitate the relocation of the development*".	a preliminary assessment of water environment effects.
Government's Green Future: 25 Year Plan to Improve the Environment (Ref 18-41*)*	
Sets out the government's goals for improving the environment within a generation and leaving it in a better state than we found it. With regards to the water environment, the Plan includes specific goals to reduce the environmental impact of water abstraction, meet the objectives of River Basin Management Plans under the WFD, reduce leakage from water mains, improve the quality of bathing waters, restore protected freshwater site to a favourable condition, and do more to protect communities and businesses from the impact of flooding, coastal erosion and drought.	The green future plans were used in **Section 18.5** for assessing the impact of the development on the river estuary bordering the Site.
Government's Water Strategy for England, Future Water (Ref 18-42)	
Sets out the government's goals for improving the aquatic environment within a generation ensuring that water quality remains high, with resources being maintained and future drought scenarios being mitigated with the environment also being protected from climate change events.	The strategy has been used during the completion of **Sections 18.4** where baseline conditions and future impacts are explored.
Non-statutory Technical Standards for Sustainable Drainage Systems (SuDS) (Ref 18-43)	
Sets out the Government's long-term vision for water and the framework for water management in England. It aims to permit the supply of secured water supplies whilst ensuring an improved and protected water environment. Planning policy encourages developers to include SuDS in their proposals where practicable. Defra have provided guidance on the use, design and construction of SuDS in Non-Statutory Technical Standards.	This technical standard is being used to assess the SuDS requirements within the FRA (which will be submitted with the DCO application and referenced by the ES) and the Drainage Strategy to be submitted as part of the ES.
North East Lincolnshire Council (NELC) Local Plan (Ref 18-14)	
The following policies of the NELC Local Plan are relevant to the water quality, coastal protection, flood risk and drainage assessment: Policy 33: Flood Risk. This policy outlines the requirements of the Sequential and Exception Tests and sets out criteria that development proposals should demonstrate in order to minimise flood risk impacts and mitigate against the likely effects of climate change. This criteria includes a undertaking a site-specific flood risk assessment , no unacceptable increased risk of flooding to the development site or	Key information has been provided within the NELC local planning rules for the FRA, the contents of which has been reviewed for the completion of the flooding assessments within **Sections 18.4** and **18.7**.

Legislation/ Policy/ Guidance	Consideration within the PEI Report
existing properties, the development will be safe during its lifetime, SuDS have been incorporated into the development unless their use has been deemed inappropriate, opportunities to provide NFM and mitigation through green infrastructure, arrangements for the adoption, maintenance and management of any mitigation measures, access to any watercourse or flood defence asset for maintenance, clearance, repair or replacement is not adversely affected; and the restoration, improvement or provision of additional flood defence infrastructure represents an appropriate response to local flood risk, and does not conflict with other Plan policies. Policy 34: Water Management. This policy outlines the requirements of development proposals in relation to potential impacts to surface and groundwater. Such requirements include sustainable and adequate water supplies on site, efficient water use, adequate foul water treatment and appropriate sewerage systems. The Humber River Basin Management Plan (RBMP) should be considered. The policy also refers to the importance of protecting groundwater within Source Protection Zones (SPZ) during construction and operational phases. Policy 33: Flood Risk. This policy outlines the requirements of the Sequential and Exception Tests and sets out criteria that development proposals should demonstrate in order to minimise flood risk impacts and mitigate against the likely effects of climate change. This criteria includes a undertaking a site-specific flood risk assessment , no unacceptable increased risk of flooding to the development site or existing properties, the development will be safe during its lifetime, SuDS have been incorporated into the development unless their use has been deemed inappropriate, opportunities to provide NFM and mitigation through green infrastructure, arrangements for the adoption, maintenance and management of any mitigation measures, access to any watercourse or flood defence asset for maintenance, clearance, repair or replacement is not adversely affected; and the restoration, improvement or provision of additional flood defence infrastructure represents an appropriate response to local flood risk, and does not conflict with other Plan policies. Policy 40: Developing a green infrastructure network. This policy outlines the importance of green spaces and infrastructure within developments, as well as biodiversity, climate change mitigation and sustainable water management. As part of this policy, open areas between Immingham and the northern industrial development will be given specific protection. Policy 40: Developing a green infrastructure network. This policy outlines the importance of green spaces and infrastructure within developments, as well as biodiversity, climate change mitigation and sustainable water management. As part of this policy, open areas between Immingham and the northern industrial development will be given specific protection.	

18.3 Assessment Scope

18.3.1 There is no standard guidance in place for the assessment of the likely significant effects on the water environment from developments of this type. Based on professional judgement and experience of other similar schemes, a qualitative assessment of the likely significant effects on surface water quality, coastal protection, flood risk and drainage receptors would be undertaken.

18.3.2 The classification and significance of effects would be determined using the principles of the guidance and the criteria set out in DMRB LA 113 (Ref 18-17) adapted to take account of hydromorphology. Although these assessment criteria were developed for road infrastructure projects, this method is suitable for use on any development project and it provides a robust and well tested method for predicting the significance of effects. The methodology also considers advice set out in DfT TAG Unit A3, Environmental Impact Appraisal (Ref 18-18).

18.3.3 Following DMRB LA 113 (Ref 18-17), the importance of the receptor (refer to) and the magnitude of impact (refer to) are determined independently and are then used to determine the overall classification and significance of effects (refer to).

18.3.4 Whilst other disciplines may consider ‘receptor sensitivity’, ‘receptor importance’ is considered here. This is because when considering the water environment, the availability of dilution means that there can be a difference in the sensitivity and importance of a water body. For example, a small drainage ditch of low conservation value and biodiversity with limited other socio-economic attributes, is very sensitive to impacts, whereas an important regional scale watercourse, that may have conservation interest of international and national significance and support a wider range of important socio-economic uses, is less sensitive by virtue of its ability to assimilate discharges and physical effects. Irrespective of importance, all controlled waters in England are protected by law from being polluted.

Table 18.3 Defining the Importance/Sensitivity of Water Receptors

Importance	General Criteria	Surface Water	Hydromorphology	Flood Risk
Very high	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.	Watercourse having a WFD classification as shown in a River Basin Management Plan (RBMP) and Q95 ≥ 1.0m^3/ s; Site protected/ designated under international or UK habitat legislation (SAC, SPA, SSSI, WPZ, Ramsar Site). Critical social or economic uses (e.g. public water supply and navigation).	Unmodified, near to or pristine conditions, with well-developed and diverse geomorphic forms and processes characteristic of river and lake type.	Floodplain or defence protecting more than 100 residential properties from flooding; Flood Zone 3a and/ or 3b; Essential Infrastructure or highly vulnerable development; Human receptors – general public / visitors; Offsite regional sewerage networks
High	Receptor of national or regional importance with a low ability to absorb change without fundamentally altering its present character.	Watercourse having a WFD classification as shown in a River Basin Management Plan (RBMP) and Q95 < 1.0m^3/ s; Major Cyprinid Fishery; Species protected under international or UK habitat legislation. Critical social or economic uses (e.g. water supply and navigation). Important social or economic uses such as water supply, navigation or mineral extraction.	Conforms closely to natural, unaltered state and would often exhibit well-developed and diverse geomorphic forms and processes characteristic of river and lake type. Deviates from natural conditions due to direct and/ or indirect channel, floodplain, bank modifications and/ or catchment development pressures.	Floodplain or defence protecting between 10 and 100 residential properties or industrial premises from flooding; Flood Zone 3a; More vulnerable development; Human receptors – construction workers and site operatives with knowledge of site conditions; Low lying land and local pumped drainage network.
Medium	Receptor of regional or local importance, with medium ability to absorb, adapt to or recover from change. The receptor is of regional or local importance and has medium capacity to absorb change, adapt to or recover from	Watercourse detailed in the Digital River Network but not having a WFD classification as shown in a RBMP. May be designated as a local wildlife Site (LWS) and support a small/ limited population	Shows signs of previous alteration and/ or minor flow/ water level regulation but still retains some natural features or may be recovering towards conditions indicative of the higher category.	Floodplain or defence protecting 10 or fewer industrial properties from flooding; Flood Zone 2; Less vulnerable development; Surface water drainage network including drainage ditches.

Importance	General Criteria	Surface Water	Hydromorphology	Flood Risk
	change without significantly altering its present character.	of protected species. Limited social or economic uses.		
Low	The receptor is of local importance and tolerant of change without detriment to its character (i.e. has some ability to absorb, adapt to or recover from change).	Surface water sewer, agricultural drainage ditch; non-aquifer WFD Class 'Poor' or undesignated in its own right. Low aquatic fauna and flora biodiversity and no protected species. Minimal economic or social uses.	Substantially modified by past land use, previous engineering works or flow/ water level regulation. Likely to possess an artificial cross-section would probably be deficient in bedforms and bankside vegetation. May also be realigned or channelised with hard bank protection, or culverted and enclosed. May be significantly impounded or abstracted for water resources use. Could be impacted by navigation, with associated high degree of flow regulation and bank protection, and probable strategic need for maintenance dredging. Artificial and minor drains and ditches would fall into this category.	Floodplain with limited constraints and low probability of flooding of residential and industrial properties; Flood Zone 1; Water compatible development; Local drainage network (existing private site drainage or soakaway).
Negligible	Receptor is resistant to change and is of little or no environmental value.	Not applicable.	Not applicable.	Not applicable.
Note 1: Professional judgement is applied when assigning an importance category to all water features. The WFD status of a watercourse is not an overriding factor and, in many instances, it may be appropriate to upgrade a watercourse which is currently at poor or moderate status to a category of higher importance to reflect its overall value in terms of other attributes and WFD targets for the watercourse. Likewise, a watercourse may be below Good Ecological Status, this does not mean that a poorer quality discharge can be emitted. All controlled waters are protected from pollution under the				

Importance	General Criteria	Surface Water	Hydromorphology	Flood Risk
Environmental Permitting (England and Wales) Regulations 2016 (Ref 18-25) and the Water Resources Act 1991 (as amended) (Ref 18-26), and future WFD targets also need to be considered. Note 2: Based on the water body 'Reach Conservation Status' presently being adopted for a major infrastructure project (and developed originally by Atkins) and developed from Environment Agency conservation status guidance (Ref 18-23 and 18-24) as LA113 does not provide any criteria for morphology.				

Table 18.4 Determining Magnitude of Impact on Water Receptors

Level of Magnitude	Definition of Magnitude and Examples
Major Adverse	Results in a loss of attribute and/ or quality and integrity of the attribute. For example, loss of a fishery; decrease in surface water ecological or chemical WFD status or groundwater qualitative or quantitative WFD status. Change in flood risk to receptor from low or medium to high.
Moderate Adverse	Results in impact on integrity of attribute, or loss of part of attribute. For example, partial loss of a fishery; measurable decrease in surface water ecological or chemical quality, or flow; reversible change in the yield or quality of an aquifer; such that existing users are affected, but not changing any WFD status. Change in flood risk to receptor from low to medium.
Minor Adverse	Results in some measurable change in attribute's quality or vulnerability. For example, measurable decrease in surface water ecological or chemical quality, or flow; decrease in yield or quality of aquifer; not affecting existing users or changing any WFD status. Change in flood risk to receptor from no risk to low risk.
Negligible	Results in impact on attribute, but of insufficient magnitude to affect the use or integrity. For example, negligible change discharges to watercourse or changes to an aquifer which lead to no change in the attribute's integrity.
Small Beneficial	Results in some beneficial impact on attribute or a reduced risk of negative impact occurring. For example, measurable increase in surface water ecological or chemical quality; increase in yield or quality of aquifer not affecting existing users or changing any WFD status. Change in flood risk to receptor from low risk to no risk.

Level of Magnitude	Definition of Magnitude and Examples
Medium Beneficial	Results in moderate improvement of attribute quality. For example, measurable increase in surface water quality or in the yield or quality of aquifer benefiting existing users but not changing any WFD status. Change in flood risk to receptor from medium to low.
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Water Framework Directive (WFD) Assessment

18.3.5 A WFD assessment would be undertaken to determine the potential implications of the Project on the objectives of the relevant water bodies. This assessment would be based on the information and analysis provided within the ES in relation to changes in physical processes, water and sediment quality, and impacts on marine and terrestrial ecological receptors. The WFD assessment would be provided as an appendix to the ES following the format specified in the latest *Clearing the Waters for All* guidance.

Flood Risk Assessment (FRA)

18.3.6 An FRA will be prepared in accordance with the NPSfP, NPS EN-1 and NPPF due to the size (over 1ha) and location of the Project (in Flood Zone 3). The FRA would assess the flood risk both to and from the Project and demonstrate how that flood risk would be managed over the Project's lifetime, to satisfy the requirements of the Sequential Test and Exception Test. The FRA would give due regard to climate change. This would inform the design of the Project (including finished ground and floor levels) as well as the water environment impact assessment reported in the ES.

Study Area

18.3.7 The Site location is shown on **Figure 1.1** (PEI Report, Volume III)**,** whilst **Figure 2.3** (PEI Report, Volume III) shows the Site plan for the Project, outlining the location of the West Site, Pipeline, East Site, Temporary Construction Area and Jetty sites.

18.3.8 For the purposes of the water quality assessment, a study area of approximately 1km around the Site boundary (**Figure 18.1** PEI Report, Volume III) has been considered in order to identify surface water bodies that could reasonably be affected (directly or indirectly) by the Project. However, since watercourse flow and water quality impacts may propagate downstream, where relevant, the assessment also considers a wider study area based on professional judgement.

18.3.9 As coastal protection, flood risk and drainage impacts can impact upstream and downstream, this chapter and the FRA (to be prepared and submitted with the DCO Application) considers a wider study area, where relevant. Professional judgement around hydrological linkages is being applied to identify the extent to which such features are considered in the next section.

Baseline Data Collection

18.3.10 A desk-based study has been undertaken to inform the baseline characterisation regarding water quality, coastal protection, flood risk and drainage on which the impact assessment has been based. The following key data sources have been reviewed:

a. Catchment Data Explorer website (Ref 18-28).

b. Multi-Agency Geographic Information for the Countryside (MAGIC) website (Ref 18-29).

c. Flamborough Head to Gibraltar Point Shoreline Management Plan (Ref 18-30).

d. Humber Flood Risk Management Strategy (note that this strategy is currently being updated and will be incorporated into the assessment should the update be completed and made publicly available) (Ref 18-3).

e. Environment Agency Flood Maps for Planning (https:// flood-map-for-planning.service.gov.uk) (Ref 18-4).

f. Environment Agency Long-term Information Service Check the long term flood risk for an area in England – GOV.UK (www.gov.uk) (Ref 18-5).

Stakeholder Engagement

18.3.11 A range of stakeholders have been engaged as part of the scoping process to obtain their views on the Project and the scope of the water quality, coastal protection, flood risk and drainage assessment, the results of which are presented within the Scoping Opinion (**Appendix 1.A** of PEI Report, Volume IV).

18.3.12 Consultation will be undertaken with the following stakeholders to discuss any further potential issues relating to water quality, coastal protection, flood risk and drainage:

a. Environment Agency.

b. North-East Lindsey Internal Drainage Board.

c. Coal Authority.

d. Natural England.

e. Immingham Town Council.

f. Lincolnshire Council.

g. North East Lincolnshire Council (NELC).

h. Crown Estate.

i. The Port Authority.

j. Marine Management Organisation (MMO).

Limitations and Assumptions

18.3.13 The information presented in this preliminary assessment reflects that obtained and evaluated at the time of reporting and is based on an emerging design for the Project and the maximum likely extents of land required for its construction and operation, in accordance with the application of the Rochdale Envelope approach.

18.3.14 The FRA for the Project is ongoing and will be submitted with the DCO Application and referenced in the ES. The FRA will consider the Environment Agency's Coastal Hazard Mapping and the residual risk from coastal flooding. The management of surface water runoff and its disposal from the Site will be considered during the development of the drainage strategy. Water resource needs for the Project have not yet been fully quantified, but a source of water for

cooling purposes, fire water for emergencies and a source of potable water would be required. This will be assessed in the ES.

18.3.15 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further through the assessment and consultation processes, and as further research and investigative surveys are completed to fully understand its potential effects.

18.4 Baseline Conditions

Current Baseline

Water Quality

18.4.1 The following key water environment receptors have been identified in the vicinity of the Project:

a. The Humber Estuary (Humber Estuary TraC Operational Catchment) and in particular the Lower Humber (GB530402609201) which forms the eastern boundary of the Site boundary. The review of this waterbody's sensitivity is considered in **Chapter 17**: **Marine Water and Sediment Quality**.

b. North Beck Drain, Middle Drain and Habrough Marsh Drain (a North East Lindsey internal drainage board (IDB) watercourse skirts the southern and western perimeters of the port estate flowing from south to north) are all located in the vicinity of the Site boundary (part of Becks Northern Operational Catchment). A summary of WFD data for 2019 for this water body is provided in **Table 18.5**.

c. On-shore WFD water bodies: North Beck Drain (GB104029067575) and North Lincolnshire Chalk Unit waterbody (GB40401G401500). The conditions of these waterbodies are Moderate ecological status and Poor overall status, respectively. These classifications by the Environment Agency are based on 'lowest' category, which for the surface water body is ecological status and for groundwater is around resources. A summary of WFD data for 2019 for North Beck Drain and North Lincolnshire Chalk Unit waterbody are provided in **Table 18.5**.

d. Various ecological sites:

   i. Humber Estuary (Ramsar, SPA and SAC). The review of these protected sites is included in **Chapter 17**: **Marine Water and Sediment Quality**.

   ii. On-shore limited conservation value apart from small patches of Priority Habitat (Coastal and Floodplain Grazing Marsh and Good quality semi-improved grassland: Non-Priority).

18.4.2 There are a number of large source protection zones (SPZ) local to the Project, including an SPZ1 (inner zone) lying very close to the edge of the Immingham Docks site. The other SPZs are located west of the coastal strip (presumably designed to minimise saline intrusion). The various abstraction licences associated with these SPZs are described in **Chapter 21**: **Ground Conditions and Land Quality**.

18.4.3 Lying further to the west of the coast (west of A180) are various Drinking Water Safeguard Zones (Groundwater) associated with catchments of the SPZs as described above. There are no Drinking Water Safeguard Zones (Surface Waters) in the vicinity of the Site. The Drinking Water Safeguard Zones (Groundwater) are considered in **Chapter 17: Marine Water and Sediment Quality**.

Table 18.5 Summary of WFD Data for On-shore Water Bodies (2019)

Classification Item	North Beck Drain (GB104029067575)
Ecological	Moderate
Biological quality elements	N/A
Invertebrates	N/A
Physico-chemical quality elements	N/A
Ammonia (Phys-Chem)	N/A
Hydromorphological supporting elements	Supports good
Supporting elements (surface water)	Moderate
Specific pollutants	High
Chromium (VI)	High
Chemical	Fail
Priority hazardous substances	Fail
Priority substances	Good
Other pollutants	Does not require assessment
Classification Item	**North Lincolnshire Chalk Unit waterbody (GB40401G401500)**
Overall Water Body	Poor
Quantitative	Poor
Quantitative Status element	Poor
Quantitative dependent surface water body status	Poor
Quantitative Groundwater Dependent Terrestrial Ecosystems (GWDTEs) test	Good
Quantitative saline intrusion	Good

Quantitative water balance	Good
Chemical (GW)	Poor
Chemical status element	Poor
Chemical dependent surface water body status	Good
Chemical drinking water protected area	Poor
Chemical GWDTEs test	Good
Chemical saline intrusion	Good
General chemical test	Poor
Supporting elements (groundwater)	N/A
Prevent and limit objective	Active
Trend assessment	Upward trend

18.4.4 The area surrounding the proposed Order Limits is drained via a network of small land drainage ditches that convey surface water from the surrounding areas located near to the Site to the Humber Estuary.

18.4.5 The smaller land drains and North East Lindsey IDB drains, whilst shown on the Digital Rivers Network Map, do not have ecological and chemical classification under the WFD.

Coastal Protection

18.4.6 Although the Site is shown as not benefitting from flood defences on the Environment Agency's flood maps, there are tidal flood defences in place along the entire south bank of the Humber Estuary. These tidal flood defences provide protection against a flood event with a 0.5% chance of occurring in any year, based on Still Water Tidal Levels.

18.4.7 Associated British Ports owns and is responsible for the flood defences along the frontage of Immingham Docks. The flood defences along the wider Humber Estuary south bank frontage are maintained by the Environment Agency. The Environment Agency is responsible for inspecting the condition of all flood defences, including those maintained by Associated British Ports and thus inspections are undertaken annually to ensure that any potential defects are identified early.

Flood Risk - Tidal and Fluvial Sources

18.4.8 The Environment Agency Flood Map for Planning for fluvial and tidal flooding on the Environment Agency website (accessed on 28 June 2022) show the Site is located entirely in Flood Zone 3 (high risk of flooding) when the presence of flood defences is not taken into account – refer to **Figure 18.2** (PEI Report, Volume III).

18.4.9 Definitions of Environment Agency flood zones (as defined in Table 1 of the National Planning Policy Guidance (NPPG) (Ref 18-6)) are presented in **Table 18.6**.

Table 18.6 Environment Agency Flood Zone Definitions

Flood Zone	Definition	Risk of flooding
Flood Zone 1	Land that has a low probability of flooding (less than 1 in 1,000 annual probability of river or sea flooding (<0.1%))	Low
Flood Zone 2	Land that has a medium probability of flooding (between 1 in 100 and 1 in 1,000 annual probability of river flooding (0.1-1%), or between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.1-0.5%)	Medium
Flood Zone 3a	Land that has a high probability of flooding (1 in 100 year or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%)	High
Flood Zone 3b (Functional Floodplain)	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: • land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or • land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).	Very high

18.4.10 As the Site is afforded protection from defences up to and including the 0.5% Annual Exceedance Probability (AEP) flood event still water levels, the primary risk of flooding from the Humber Estuary is a residual risk from overtopping and from a failure of flood defences.

18.4.11 Residual flood risk associated with overtopping and failure of the flood defences will be assessed in the FRA which will be submitted with the DCO application and referred to in the ES.

18.4.12 Tide-locking is a common problem in watercourses where defences occur. Habrough Marsh Drain (Ordinary Watercourse) and North Beck Drain (Main River) are both gravity drainage systems with a flapped outfall into the Humber to prevent the incoming tide from entering the channel when water levels in the estuary are high. When high tides prevent the watercourses from discharging into the Humber Estuary, water levels within the drains increase temporarily until the tidal level has decreased sufficiently to allow the outfall to operate again. Areas of the Site located directly adjacent to Habrough Marsh Drain and the North Beck Drain are at residual risk of fluvial flooding during tide-locking events.

Flooding from Artificial Sources

18.4.13 The Environment Agency has produced maps based on mathematical modelling showing the extent of flooding in the unlikely event of large reservoir breaching in England and Wales (accessed online 28 June 2022). The Environment Agency Long-Term Flood Risk Map shows the Site is not at risk of flooding from reservoir failure.

Groundwater Flooding

18.4.14 There are no historical flood records for groundwater flooding within the Site or the wider Port of Immingham area. Limited historical ground investigation (GI) records indicate the presence of perched/shallow groundwater within the study area. Therefore, given the limited information on groundwater and potential for groundwater flooding in the area, the baseline condition for the risk of flooding from groundwater sources at the existing Site is currently a medium risk. This will be assessed further when site-specific Ground Investigation data becomes available.

Surface Water (Pluvial) Flooding

18.4.15 The Environment Agency Risk of Flooding from Surface Water (RoFSW) maps (accessed online 28 June 2022) indicate areas at risk from surface water flooding when rainwater does not drain away through the normal drainage systems or soak into the ground, but instead lies on or flows over the ground.

18.4.16 The risk of surface water is defined by the Environment Agency, with these risks being defined in accordance with **Table 18.7**.

Table 18.7 Definition of Risk from Surface Water Flooding

Risk of flooding	Definition
Very low	Each year, the area has a chance of flooding of less than 1 in 1000 (0.1%).
Low	Each year, the area has a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%).
Medium	Each year, the area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%).
High	Each year, the area has a chance of flooding greater than 1 in 30 (3.3%).

18.4.17 The RoFSW for the area shows the Site is generally at very low to low risk of flooding from surface water sources.

Drainage

18.4.18 Anglian Water asset mapping shows that there is no surface water drainage infrastructure operated by them within the Site boundary and that drainage of surface water within the wider Port of Immingham is privately owned by Associated British Ports.

18.4.19 An Anglian Water rising foul sewer main runs beneath Kings Road flowing south-east then north-east beneath Queens Road and continues flowing north-east, discharging to the Humber Estuary via the Immingham Sea Outfall located at OS NGR TA2141715599, downstream of the Port of Immingham. In addition, package sewage treatment plants (owned by Associated British Ports) provide treatment of effluent on-site within the Port before being discharged to the Humber Estuary.

18.4.20 Surface water from hard standing areas is generally discharged (at a restricted flow rate) directly to North East Lindsey IDB adjacent watercourses and ultimately to the Humber Estuary or, directly to the Humber Estuary as an unrestricted discharge.

18.4.21 Given the generally undeveloped nature of the Site (albeit parts are brownfield), it is assumed that the land predominantly drains via natural infiltration processes to the land drains located within and adjacent to the Site. There is a possibility that historical drainage infrastructure is present beneath the East Site, however, it is not known whether this part of the Site drains via natural processes or via a piped system.

18.4.22 Further details for the current drainage scenario will be provided in the Drainage Strategy to be submitted as part of the ES.

Future Baseline

18.4.23 The future baseline is a prediction of baseline conditions in the future, assuming that the Project is not constructed. In the absence of the Project, it is anticipated that future baseline conditions would be similar to the existing baseline as described above, subject to the caveats detailed below.

18.4.24 Generally, there is an improving trend in water quality and the environmental health of waterways in the UK since the commencement of significant investment in sewage treatment in the 1990s, the adoption of the WFD from 2003, and the application of ever more stringent planning policies. In terms of water quality impacts, the future baseline assumes that all WFD waterbodies achieve their planned target status by 2027.

18.4.25 The future baseline will also be influenced by climate change. It is anticipated that the impact of climate change will include:

- Changes in storminess/storm surges, wave heights, and sea levels, posing an increased risk of coastal damage and tidal flooding.
- Changes in rainfall intensity increasing peak river flows, posing an increased risk of fluvial flooding and property damage.
- Changes in rainfall intensity increasing surface water runoff (overland flow), posing an increased risk of pluvial and drainage/ sewer flooding.

18.4.26 In addition, rainfall intensity will increase by up to 40% by the year 2125 placing increased pressure on drainage infrastructure and increasing the risk of surface water flooding.

18.4.27 It is likely that through the action of new legislative requirements and more stringent planning policy and regulation, that the health of the water environment will continue to improve post-2027. However, there are significant challenges

such as adapting to a changing climate (i.e. in general drier summers, wetter winters, and an increased frequency of significant storms are forecast for the UK); and the pressures of population/economic growth that could have a retarding effect on the water environment if it is not managed carefully through the design of projects, mitigation and the maintenance of mitigating solutions. However, it is difficult to forecast these changes with any certainty.

18.5 Design, Mitigation and Enhancement Measures

Embedded Mitigation Measures

18.5.1 Water environment constraints are being taken into account during the design of the Project, particularly with regard to the route of pipelines, the approach to the installation of any footings for above ground pipelines near to watercourses, and surface water drainage proposals. Best practice around water environment is being adopted through the Construction Environmental Management Plan (CEMP).

18.5.2 An appropriate surface water drainage system will be developed based on the requirements of regulatory authorities and a Drainage Strategy will be developed to accompany the ES.

18.5.3 An FRA will be produced which will assess the flood risk both to and from the Project and demonstrate how that flood risk would be managed over the Project's lifetime, giving due regard to climate change. Mitigation measures could include, but are not limited to, flood resistant and resilient design, appropriate finished floor levels and emergency evacuation.

Standard Mitigation Measures

18.5.4 Construction of the Project would be subject to measures and procedures defined within a CEMP, which would be produced prior to the commencement of construction by the Contractor and would be based on, and incorporate, the contents and requirements of the outline CEMP which will be submitted with the DCO Application.

18.5.5 The CEMP would define a range of best practice construction site practices aimed at protecting the water environment, – such standard mitigation may include:

a. Leaving buffer strips between any drains/boundary of the Site and construction activity, typically a strip of 8m is assumed to be best practice.

b. Bunding of assets that carry a risk of causing contamination to surface waters and land by the spillage of hazardous liquids. This could be used for storage vessels and chemical delivery areas. Provision of spill kits in areas where there is a risk of spillages of hazardous liquids.

c. Avoid undertaking construction activities when particularly wet conditions exist, which may cause surface runoff to be generated; or at a minimum put in place enhanced monitoring at such times.

d. Undertaking regular water quality monitoring be that by visual inspection or testing using hand-held probes.

Management of Hazardous Substances on Site

18.5.6 The use of the chemical products at the Site will follow the product-specific environmental guidelines, as well as the legislative requirements set out in the Control of Substances Hazardous to Health Regulations (COSHH (2002)) and during the operational phase Control of Major Accident Hazards (COMAH) Regulations (2015) and Environmental Permit.

18.5.7 A site Emergency Response Plan (prepared for Regulation 9 of the COMAH Regulations) will be in place for dealing with emergency situations involving loss of containment of hazardous substances. This will detail how to contain and control incidents to minimise the effects and limit danger to persons, the environment and property. The Emergency Response Plan will set out the emergency spill control procedure that will include the actions adapted from the Health and Safety Executive's Emergency Response/ Spill Control Technical Measures Document.

18.5.8 There is further guidance in References 18-44 to 18-46 that will be consulted in development of the site Emergency Response Plan that will be completed before the site will start operation.

18.5.9 Such measures may also be applicable to protect the water environment during the Project decommissioning phase.

18.6 Potential Impacts and Effects

18.6.1 The sections below consider the potential water environment impacts during Project construction, operation and decommissioning. The potential risks to the water environment may include deterioration in water quality, increased flood risk and over-whelming the drainage network. Such impacts have the potential to lead to a deterioration in water body status (Ref 18-35).

Construction

18.6.2 Potential water environment impacts associated with the construction phase of the Project include:

a. Contamination from suspended solids or other chemical contaminants that may find their way into site runoff, infiltrate to ground, or be spilt directly into waterbodies when there are works within or adjacent to them.

b. The effects of diffuse urban pollutants in surface water runoff (that may contain metals, hydrocarbons, and inert solids etc.).

c. The risk of pollution from chemical spillages or fire on the site.

d. Alteration in fluvial and overland flow paths, and potential increase in flood risk, as a result of storing construction materials.

e. Increased risk of blockage of drains as a result of increased material (sands, gravels etc.) transported in runoff from the Site.

f. Increase in flood risk (fluvial, surface water and drainage infrastructure) due to changes to the rate and volume of surface water runoff entering the identified watercourses due to earthworks and changes in land use.

g. Increase in risk to aquatic life from potential water use and discharges to the environment.

Operation

18.6.3 The potential water environment impact pathways during the Project operational phase are as follows:

a. Potential operational pollution of surface watercourses from accidental spillages.

b. Any operational impacts on surface water courses from the Site including surface water drainage.

c. Increased risk of fluvial flooding to the development and surrounding area due to loss of floodplain storage.

d. Increased risk of flooding from fluvial flooding to the development and surrounding area over its lifetime due to climate change effects (increasing peak river flows).

e. Increase in flood risk (fluvial, surface water and drainage infrastructure) due to an increase in surface water runoff from the development.

f. Increase in risk of sewer flooding due to surface water runoff from the development.

g. Increased risk of groundwater flooding (particularly to any below ground development) as a result of high water table and/ or groundwater recharge.

h. Potential pollution incident from hazardous firefighting chemicals if a fire was to occur on the Site.

Decommissioning

18.6.4 The potential water environment impacts during the Project decommissioning phase of the landside infrastructure would be the same as those for the construction phase.

18.6.5 The DCO application would not make any provision for the decommissioning of the marine infrastructure or plant or equipment on the jetty topside. This is because the development would, once constructed, become part of the fabric of the Immingham port estate and would, in simple terms, continue to be maintained so that it can be used for port related activities to meet a long-term need. This is discussed further **Chapter 2: The Project**.

18.7 Preliminary Assessment of Residual Effects

18.7.1 A preliminary assessment of potential water environment effects has been undertaken. This initially identifies the sensitivity (value/importance) of each of the surface water receptors identified above (excluding those which are covered in **Chapter 17: Marine Water and Sediment Quality**). Potential impact pathways are then considered, after which potential effects are defined both with and without potential mitigation measures.

Construction

18.7.2 A preliminary qualitative assessment of the likely significant effects on surface water quality and flood risk receptors during the Project construction has been undertaken. This indicates that with the implementation of standard mitigation measures to be included in the CEMP, water environment effects are not likely to be significant. Significant flood risk effects are also not anticipated as it is considered that with the implementation of standard mitigation measures flood effects would be effectively implemented, such measures will be defined in the FRA to be submitted with the DCO Application and assessed within the ES.

Operation

18.7.3 A preliminary qualitative assessment of the likely significant effects on surface water quality and flood risk receptors during Project operation indicates that with the implementation of standard mitigation operational measures, water environment effects are not likely to be significant. Significant flood risk effects are also not anticipated as it is considered that with the implementation of standard mitigation measures flood effects would be effectively implemented. Such measures, for example flood resistant and resilient design, appropriate finished floor levels and emergency evacuation, will be defined in the FRA to be submitted with the DCO Application and assessed within the ES.

Decommissioning

18.7.4 The preliminary qualitative assessment of the likely significant effects on surface water quality and flood risk receptors during Project decommissioning of the landside infrastructure indicates that with the implementation of standard mitigation operational measures (such as those that would be implemented during the construction and phase and included in the DEMP), water environment effects are not likely to be significant. Similarly, significant flood risk effects are not anticipated as standard flood risk mitigation measures would be effectively implemented – such measures will be defined in the FRA to be submitted with the DCO Application and also assessed within the ES.

18.8 Summary of Preliminary Assessment

18.8.1 This preliminary assessment has identified that Project construction, operation and decommissioning have the potential to have adverse impacts and effects on both water quality and flood risk, but that with the implementation of embedded and standard mitigation, residual effects are not likely to be significant. The water quality and flood risk effects associated with the Project will be re-evaluated and reported within the ES following the confirmation of the Project design details and mitigation features. An outline CEMP will be developed to identify a range of best practice construction site practices aimed at protecting the water environment during the construction phase. An appropriate surface water drainage system will be developed based on a drainage strategy and an FRA will be produced.

18.8.2 The results of the preliminary water environment assessment for the Project construction phase are detailed in **Table 18.8**, whilst **Table 19.9** and **Table 18.10** present the results for the operational and decommissioning phases.

Table 18.8 Summary of Potential Impacts, Mitigation Measures and Residual Effects during Construction

Receptor (Sensitivity)	Impact Pathway	Effect	Mitigation Measure	Residual Effect	Confidence
North Beck Drain, Middle Drain and Habrough Marsh Drain **(Water quality/ Water flow – Medium)**	Direct spillage: Contamination from suspended solids or other chemical contaminants that may find their way into site runoff, infiltrate to ground, or be spilt directly into waterbodies when there are works within or adjacent to them.	Moderate/Major adverse	Bunded operations and spill kits to be used on Site (to be specified in the CEMP).	Negligible/Minor adverse	High
	Runoff contamination: The effects of diffuse urban pollutants in surface water runoff (that may contain metals, hydrocarbons, and inert solids etc.).	Minor/Moderate adverse	Bunded operations for all chemicals and fuels needed on Site (to be specified in the CEMP).	Negligible/Minor adverse	High
	Alteration in fluvial and overland flow paths, and potential increase in flood risk, as a result of storing construction materials in the floodplain	Minor/Moderate adverse	Areas for storage of construction materials to be carefully considered (to be specified in the CEMP).	Negligible/Minor adverse	High
	Increased risk of blockage of drains as a result of increased material (sands, gravels etc.) transported in runoff from Site.	Minor/Moderate adverse	Surface water runoff to be managed on site (to be specified in CEMP).	Negligible/Minor adverse	High
	Increase in flood risk (fluvial, surface water and drainage infrastructure) due to changes to the rate and volume of surface water runoff entering the identified watercourses due to earthworks and changes in land use.	Minor/Moderate adverse	Surface water runoff to be managed on Site (to be specified in CEMP).	Negligible/Minor adverse	High
Coastal and Floodplain Grazing Marsh	Direct spillage: Contamination from suspended solids or other chemical contaminants that may find their way into site runoff, infiltrate to ground,	Negligible/Minor adverse	Bunded operations and spill kits to be used on	Negligible	High

Receptor (Sensitivity)	Impact Pathway	Effect	Mitigation Measure	Residual Effect	Confidence
and Good quality semi-improved grassland **(Water quality – Low)**	or be spilt directly into non-priority habitat when there are works within or adjacent to them.		Site (to be specified in the CEMP).		
	Runoff contamination: The effects of diffuse urban pollutants in surface water runoff (that may contain metals, hydrocarbons, and inert solids etc.).	Negligible/Minor adverse	Bunded operations for all chemicals and fuels needed on Site (to be specified in the CEMP).	Negligible	High
Humber Estuary (Tidal flooding – medium)	Increase in flood risk (tidal) as a result of damage to existing tidal defences through works close to and over the existing structures.	Minor/Moderate adverse	Manage works close to and over the existing defence structures (to be specified in the CEMP).	Negligible	High
Human Health **Public and visitors to the site (Very High)**	Exposure to floodwater via flooding from predominantly tidal sources e.g. overtopping, such as surge events or breach of defences	Moderate adverse	Site induction, including evacuation routes, safe refuge, access, and egress. Provision of a flood response plan and will be registered with the Environment Agency Flood Warnings Direct Service. No visitors or access during periods of inclement weather.	Slight adverse	High
Human Health	Exposure to floodwater via flooding from predominantly tidal sources e.g. overtopping, such as surge events or breach of defences	Moderate adverse.	Construction works would be carried out in accordance with the CEMP, including the Flood Response Plan.	Slight adverse	High

Receptor (Sensitivity)	Impact Pathway	Effect	Mitigation Measure	Residual Effect	Confidence
Construction workers and operatives (High)			Site induction, including evacuation routes, safe refuge, access, and egress. Site will be registered with the Environment Agency Flood Warnings Direct Service. No work onsite during a flood warning period		

Table 18.9 Summary of Potential Impacts, Mitigation Measures and Residual Effects during the Operation

Receptor (Sensitivity)	Impact Pathway	Effect	Mitigation Measure	Residual Effect	Confidence
North Beck Drain, Middle Drain and Habrough Marsh Drain **(Water quality/ Water flow – Medium)**	Potential operational pollution of surface watercourses from accidental spillages.	Minor/Moderate adverse	Bunded operations and spill kits to be used on Site.	Negligible/Minor adverse	High
	Increased risk of fluvial flooding to the development and surrounding area due to loss of floodplain storage.	Negligible/ Minor adverse	Mitigation in accordance with the FRA - to be confirmed.	Negligible/Minor adverse	High
	Increased risk of flooding from fluvial flooding to the development and surrounding area over its lifetime due to climate change effects (increasing peak river flows).	Negligible/ Minor adverse	Mitigation in accordance with the FRA - to be confirmed.	Negligible/Minor adverse	High
	Increase in risk of surface water flooding due to surface water runoff from the development.	Negligible/ Minor adverse	Mitigation in accordance with the FRA and Drainage Strategy - to be confirmed.	Negligible/Minor adverse	High
	Potential run off of hazardous firefighting	Major adverse	Bunded operational area with spill kits to be used	Negligible/Minor adverse	High

Receptor (Sensitivity)	Impact Pathway	Effect	Mitigation Measure	Residual Effect	Confidence
	chemicals to surface water course		and treatment/removal of liquids		
Coastal and Floodplain Grazing Marsh and Good quality semi-improved grassland **(Water quality – Low)**	Potential operational pollution of surface watercourses from accidental spillages.	Negligible/ Minor adverse	Bunded operations and spill kits to be used on Site.	Negligible	High
Human Health Public and visitors to the site (Very High)	Exposure to floodwater via flooding from predominantly tidal sources e.g. overtopping, such as surge events or breach of defences	Moderate adverse	Site induction, including evacuation routes, safe refuge, access, and egress. Site registered with the Environment Agency Flood Warnings Direct Service	Slight adverse	High
Human Health **Site operatives and future workforce**	Exposure to floodwater via flooding from predominantly tidal sources e.g. overtopping, such as surge events or breach of defences	Moderate adverse	Flood Response Plan. Site induction, including evacuation routes, safe refuge, access, and egress. Site registered with the Environment Agency Flood Warnings Direct Service. No work onsite during a flood warning period.	Slight adverse	High

Table 18.10 Summary of Potential Impacts, Mitigation Measures and Residual Effects during Decommissioning

Receptor (Sensitivity)	Impact Pathway	Effect	Mitigation Measure	Residual Effect	Confidence
North Beck Drain, Middle Drain and Habrough Marsh Drain **(Water quality/ Water flow – Medium)**	Direct spillage: Contamination from suspended solids or other chemical contaminants that may find their way into site runoff, infiltrate to ground, or be spilt directly into waterbodies when there are works within or adjacent to them.	Moderate/Major adverse	Bunded operations and spill kits to be used on Site (to be specified in the DEMP).	Negligible/Minor adverse	High
	Runoff contamination: The effects of diffuse urban pollutants in surface water runoff (that may contain metals, hydrocarbons, and inert solids etc.).	Minor/Moderate adverse	Bunded operations for all chemicals and fuels needed on Site (to be specified in the DEMP).	Negligible/Minor adverse	High
Coastal and Floodplain Grazing Marsh and Good quality semi-improved grassland **(Water quality – Low)**	Direct spillage: Contamination from suspended solids or other chemical contaminants that may find their way into site runoff, infiltrate to ground, or be spilt directly into non-priority habitat when there are works within or adjacent to them.	Negligible/Minor adverse	Bunded operations and spill kits to be used on Site (to be specified in the DEMP).	Negligible	High
	Runoff contamination: The effects of diffuse urban pollutants in surface water runoff (that may contain metals, hydrocarbons, and inert solids etc.).	Negligible/Minor adverse	Bunded operations for all chemicals and fuels needed on Site (to be specified in the DEMP).	Negligible	High
Human Health Construction workers and operatives (High)	Exposure to floodwater via flooding from predominantly tidal sources e.g. overtopping, such as surge events or breach of defences	Moderate adverse	Construction works would be carried out in accordance with the CEMP, including the Flood Response Plan. Site induction,	Slight adverse	High

Receptor (Sensitivity)	Impact Pathway	Effect	Mitigation Measure	Residual Effect	Confidence
			including evacuation routes, safe refuge, access, and egress. Site will be registered with the Environment Agency Flood Warnings Direct Service. No work onsite during a flood warning period		

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18.10 Abbreviations and Glossary of Terms

Term	Acronym	Meaning
Associated British Ports	ABP	One of the UK's leading and best connected ports groups, owning and operating 21 ports across England, Wales and Scotland.
Annual Exceedance Probability	AEP	The chance or probability of a natural hazard event (usually a rainfall or flooding event) occurring annually and is usually expressed as a percentage.
Construction Environmental Management Plan	CEMP	A Construction Environmental Management Plan describes the specific mitigation measures to be followed by the appointed construction contractor to reduce potential nuisance impacts.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Department of Environment and Rural Affairs	DEFRA	The Government department responsible for policy and regulations on environmental, food and rural issues.
Environment Agency	EA	Government agency established to protect and improve the environment and contribute to sustainable development in England. Responsibilities include: water quality and resources, flooding and coastal risk management and contaminated land.
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.

European Union	EU	Supranational political and economic union of 27 member states primarily located in Europe.
Flood Risk Assessment	FRA	The process of assessing potential flood risk to a site and identifying whether there are any flooding or surface water management issues that may warrant further consideration or may affect the feasibility of a project.
Ground Investigation	GI	An intrusive investigation to establish the soil and rock profile and parameters for Geotechnical and Environmental purposes.
Hectares	Ha	A unit of surface area (symbol ha) equal to 100 acres, used for measuring the areas of geographical features such as land and bodies of water.
Internal Drainage Board	IDB	A public body that manages water levels in an area, known as an internal drainage district, where there is a special need for drainage.
Local Planning Authority	LPA	Local government body that is empowered by law to exercise urban planning functions for a particular area.
Multi-Agency Geographic Information Service	MAGIC	A website which provides geographic information about the natural environment.
Marine Management Organisation	MMO	The Marine Management Organisation is an executive non-departmental public body in the United Kingdom established under the Marine and Coastal Access Act 2009, with responsibility for English waters.
North-East Lincolnshire Council	NELC	Local authority of North-East Lincolnshire.
National Planning Policy Framework	NPPF	A planning framework which sets out the government's planning policies for England and how these are expected to be applied.

National Planning Practice Guidance	NPPG	This is a web-based resource used to support the National Planning Policy Framework.
National Policy Statement for Ports	NPSfP	The National Policy Statement for Ports provides the framework for decisions on proposals for new port development.
Nationally Significant Infrastructure Project	NSIP	Major infrastructure developments in England and Wales that bypass normal local planning requirements.
Outline Environmental Management Plan	OEMP	Outlines how actions might impact on the natural environment in which they occur and sets out commitments from the person taking the actions on how those impacts will be avoided, minimised, and managed.
Preliminary Environment Information Report	PEIR	A report that compiles and presents the Preliminary Environmental Information gathered for a project.
Risk of Flooding from Surface Water Maps	RoFSW	Mapping of the long-term flood risk for areas in England from surface water.
Source Protection Zone	SPZ	Zones which show the level of risk to the source from contamination.
Sustainable Drainage Systems	SuDS	Drainage solutions that are considered to be environmentally beneficial, causing minimal or no long-term damage.
Water Framework Directive	WFD	Water Framework Directive is an EU directive which commits European Union member state to achieve good qualitative and quantitative status of all water bodies.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 19: Climate Change

Associated British Ports

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Table of contents

Tables

Plates

19 Climate Change

19.1 Introduction

19.1.1 This chapter presents the preliminary findings of the assessment of the likely significant effects of the Project in relation to climate change.

19.1.2 To align with the requirements of the 2017 EIA Regulations (Ref 19-1) and Institute of Environmental Management and Assessment (IEMA) guidance on assessing climate change mitigation (Ref 19-2) and adaptation (Ref 19-3) consideration of climate change effects is covered by the following three aspects:

a. Lifecycle greenhouse gas (GHG) impact assessment - Impact of GHG emissions arising from the Project on the climate, including how it would affect the ability of the UK government to meet its planned carbon reduction targets (19-4).

b. Climate change resilience (CCR) assessment - The resilience of the Project to climate change impacts, including how the design would consider projected impacts of climate change.

c. In-combination climate change impact (ICCI) assessment - The combined impact of the Project and potential climate change on the receiving environment.

19.1.3 The ICCI assessment will be addressed through identification of in-combination climate change impacts in the relevant chapters of the ES, namely:

a. **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage**

19.1.4 When considering the GHG impacts of the Project, consideration has been given in this chapter not only to the direct impacts of the Project – which are assessed - but also to the Project in the wider context of its role in helping to meet the UK's target to achieve net zero emissions by 2050. The Project is anticipated to produce 300 MW of green hydrogen per annum, once fully operational at full capacity, the equivalent of up to 9.5 billion MJ per annum. Depending on market demand, it is estimated that this will meet up to 3% of Government's hydrogen production capacity target.

19.1.5 Based on these assumptions the hydrogen produced by the Project could reduce annual emissions of CO_2 associated with HGV truck movements by up to 578,000 tonnes per year from 2030 as a result of fuel switching from diesel to hydrogen.

19.1.6 There are no figures or appendices associated with this chapter.

19.2 Approach to Assessment

Scope and Methods

19.2.1 A scoping exercise was undertaken in August 2022 to establish the form and nature of the climate change assessment, and the approach and methods to be followed.

19.2.2 The Scoping Report (**Appendix 1.A** of the PEI Report, Volume IV) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on climate change.

19.2.3 Following receipt of the Scoping Opinion (**Appendix 1.B** of the PEI Report, Volume IV) as to the information to be provided in the Environmental Statement (ES), the requirements set out in **Table 19.1** have been agreed with the Planning Inspectorate to be taken into account as part of the ongoing climate change assessment.

Table 19.1 Scoping opinion comments on climate change

Consultee	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	The Scoping Report proposes to scope out GHG emissions arising from operational maintenance activities on the grounds that emissions from maintenance works are likely to be minimal in relation to the overall GHG emissions from the Proposed Development. However, the Scoping Report does not provide any supporting evidence for this statement. In the absence of such evidence, and particularly given the uncertainty around dredging requirements, Inspectorate is not in a position to agree to scope these matters from the assessment. Accordingly, the ES should include an assessment of these matters or further justification that the works are likely to give rise to minimal GHG emissions.	Emissions from operational maintenance works will be considered in the GHG assessment. (**Table 19.3**) Note the GHG assessment has considered the seven Kyoto Protocol gases: Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N2O), Sulphur hexafluoride (SF_6), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs); and Nitrogen Trifluoride (NF_3).
	The Scoping Report proposes to scope out the impacts of wind from both the climate change resilience (CCR) assessment and the in-combination climate change impact (ICCI) assessment, on the basis that there is no evidence to suggest that climate change is increasing high wind events (referencing the Met Office (2020) State of the UK Climate report). The Inspectorate notes that Environment Agency guidance (2021) Refineries and fuel: examples for your adapting	Mitigation measures against wind storms have been included in this assessment (see **Table 19.18**)

Consultee	Summary of Response	How comments have been addressed in this chapter
	to climate change risk assessment, specifically considers wind stating *"there is risk to: jetties with higher sideways loadings due to wave and wind action"*. In light of this guidance and in absence of agreement with the relevant statutory body, the Inspectorate is not in a position to agree to scope this matter from the assessment.	
	The ES should state which emissions scenario will be applied from the UK Climate Projection 2018 (UKCP18) data as this is not currently clear from the Scoping Report. The ES should be based on up-to-date climate projections at the point of submission.	This has been explicitly stated in the assessment (see **Paragraph 19.3.10**).
	The transportation and disposal of waste is listed as source of emissions but dredging and disposal of dredged material is not explicitly included within this. The ES should consider emissions from these activities.	Data to calculate emissions from dredging was not available for the PEI Report assessment. It will be updated for the GHG assessment for the Environmental Statement.
Environment Agency	Paragraph 18.3.7 advises that wind change has been ruled out for the climate change resilience review. Environment Agency guidance on climate change adaption for refineries specifically considers wind stating *"there is risk to: jetties with higher sideways loadings due to wave and wind action".* Accordingly, we would suggest it may be relevant to scope in this issue.	Mitigation measures against wind storms have been included in this assessment (see **Table 19.16**).
	The Applicant may also find it useful to refer to government guidance on Adapting to climate change: industry sector examples for your risk assessment - GOV.UK (www.gov.uk), with specific consideration to the guidance for the 'Chemical' and 'refineries and fuel' sectors, as the closest relevant sectors.	This has been reviewed, and any relevant guidance included in this assessment.

Consultee	Summary of Response	How comments have been addressed in this chapter
	We would also ask that the EIA is clear about which emissions scenario will be used from the UKCP18 data as this is not currently clear from the Scoping Report	This has been explicitly stated in the assessment (see **Paragraph 19.3.10**).

Legislation, Policy and Guidance

19.2.4 **Table 19.2** presents the legislation, policy and guidance relevant to the climate change assessment and details how their requirements will be met.

Table 19.2 Relevant legislation, policy and guidance regarding climate change

Legislation / Policy / Guidance	Consideration within the PEI Report
United Nations Framework Convention on Climate Change Paris Agreement (Ref 19-5)	
The Framework requires all signatories to strengthen their climate change mitigation efforts to keep global warming to below 2°C this century and to pursue efforts to limit global warming to 1.5°C.	Since its withdrawal from the EU, the UK Government declares its own Nationally Determined Contribution (NDC) setting out its climate change obligations under the Paris Agreement and the climate change target and budgets set under the Climate Change Act 2008 (Ref 19-6). **Section 19.6** presents an assessment to identify the impact of the Project on the UK meeting its climate change target and five-yearly carbon budgets. In support of this the embedded and additional mitigation measures of the Project are set out in the **Section 19.5**.
Climate Change Act 2008 and **Climate Change Act (2050 Target Amendment) Order 2019** (Ref 19-6)	
The Climate Act 2008 was amended in 2019 to revise the existing 80% reduction target and legislate for Net Zero emissions by 2050 (through the Climate Change Act 2008 (2050 Target Amendment) Order 2019). This target is supported by a system of legally binding five-year 'carbon budgets' and an independent body, the Committee on Climate Change (CCC), is to advise on budgets and monitor progress. The UK carbon budgets restrict the amount of GHG emissions the UK can legally emit in a defined five-year period. The 6th Carbon Budget (Ref 19-7) is the first budget to reflect the amended trajectory to Net Zero by 2050 and came into force in June 2021.	An objective of the Project is to deliver the port infrastructure needed to support the future transportation of bulk liquids associated with the energy sector that would support the transition to net zero. The new jetty would further support sustainable development by providing additional capacity for the development of the renewable energy and carbon capture sectors. An assessment of the impact of the Project against the Government's carbon target and budgets is set out in **Section19.6**. Embedded and good practice mitigation measures have been identified in **Section 19.5**.

Legislation / Policy / Guidance	Consideration within the PEI Report
The Infrastructure Planning (Environmental Impact Assessment) Regulations ('the EIA Regulations') (Ref 19-8)	
The EIA Regulations state that an EIA (where relevant): *"must include a description of the likely significant effects of the development on the environment resulting from… the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change".*	Likely significant effects as a result of the vulnerability of the Project to climate change, following the inclusion of embedded and good practice mitigation measures, are presented in **Sections 19.6** and **19.7**. Likely significant effects on the climate as a result of the Project are assessed in **Section 19.6**.
The National Policy Statement for Ports (NPSfP) (Ref 19-9)	
The NPSfP is one of a number of national policy statements (NPS) established under the 2008 Act (Ref 19-6) to deal with different NSIPs. It provides the framework for decisions on proposals for harbour facility NSIPs and is the relevant NPS for determining the IGET application. It states that: *"information sought from applicants should be proportionate to the scale of proposed development and associated impacts, including its likely impact on and vulnerability to climate change, as well as all other aspects of conformity with this NPS".*	The climate change assessment presented in this chapter considers impact of GHG emissions arising from the Project on the climate, and the resilience of the Project to climate change impacts which are presented in **Section 19.6**.
The National Planning Policy Framework (NPFF) (Ref 19-10)	
The Framework sets out the Government's planning policies for England. While the NPPF does not set specific policies for Nationally Significant Infrastructure Projects (NSIP), its policies may be of relevance to the decision-making process. Policies of relevance to climate change and sustainability assessment include those aimed at achieving sustainable development and meeting the challenge of moving to a low carbon economy, climate change, flooding and coastal change. The NPPF states that the planning system should support this transition by supporting low carbon energy and associated infrastructure.	The GHG emissions methodology and assessment described in the Scoping Report (**Appendix 1.A** of the PEI Report, Volume IV) respectively have been developed in line with the NPPF guidance. Mitigation measures to minimise and mitigate the impacts of GHG emissions on climate change from the Project and embedded adaptation measures to minimise effects of climate change are set out in **Section 19.5**.
National Planning Policy Guidance on Climate Change (Ref 19-11)	
The guidance describes how to identify suitable mitigation and climate adaptation measures to incorporate into the planning process, stating that: *"Effective spatial planning is an important part of a successful response to climate change as it can influence the emission of greenhouse gases…*	The guidance sets climate change allowances to be included in flood risk assessments, which have been considered as part of the design as outlined in **Section 19.5**.

Legislation / Policy / Guidance	Consideration within the PEI Report
Planning can also help increase resilience to climate change impact through the location, mix and design of development."	
Our Green Future: Our 25-year Plan to Improve the Environment (Ref 19-20)	
The plan sets out the Government proposed action to help the natural world regain and retain good health. It aims to deliver cleaner air and water in our cities and rural landscapes, protect threatened species and provide richer wildlife habitats.	Embedded adaptation measures to minimise effects of climate change are set out in **Section 19.5**.
Decarbonising Transport: A Better Greener Britain (Ref 19-12)	
The plan sets out the Government's commitments and actions needed to decarbonise the transport system in the UK before 2050. The plan proposes to plot a course to net zero for the UK domestic maritime sector, with indicative targets from 2030 and net-zero as early as is feasible – public consultation is planned in 2022, followed by strategy 'Course to Zero'; there is also a planned review and refresh of Clean Maritime Plan.	The objective of the Project is to deliver the port infrastructure needed to support the future transportation of liquid bulks associated with the energy sector that would support the transition to net zero. The new jetty would further support sustainable development by providing additional capacity for the development of the renewable energy and carbon capture sectors. Mitigation measures to minimise and mitigate the impacts of GHG emissions on climate change from the Project and embedded adaptation measures to minimise effects of climate change are set out in **Section 19.5**.
North East Lincolnshire Council (NELC) Environmental Policy Statement (Ref 19-13)	
The statement sets out NELC's priorities in taking action towards consuming resources more efficiently, eliminating waste and supporting & developing the green economy & infrastructure, including a commitment to support environmentally responsive local economic growth.	The Project supports the priorities of developing the green economy and infrastructure. It responds to the requirements set out in policy SO2 Climate Change in the NELC Plan which requires development to address the causes and effects of climate change for example by minimising energy and natural resource use and encouraging opportunities for sustainable transport. Mitigation measures to minimise and mitigate the impacts of GHG emissions on climate change from the Project and embedded adaptation measures to minimise effects of climate change are set out in **Section 19.5**.
North East Lincolnshire Council (NELC) Carbon Roadmap (Ref 19-14)	
The roadmap sets out how the Council plans to achieve its aim to cut its carbon emissions to net zero by 2040 and for North East Lincolnshire to be carbon net zero by 2050.	Mitigation measures incorporated into the Project design, construction and operation to minimise and mitigate the impacts of GHG emissions on climate change from the Project are set out in **Section 19.5**.

Legislation / Policy / Guidance	Consideration within the PEI Report
North East Lincolnshire Council (NELC) Natural Assets Plan (Ref 19-15)	
The plan sets out how the Council and its partners can improve the area's unique natural environment for the benefit of everyone. The plan sets out eight areas that the Council wants to focus on that will help to adapt and mitigate effects of climate change.	Embedded adaptation measures to minimise effects of climate change are set out in **Section 19.5**. Measures to address the eight areas of the plan are still under consideration and will be updated in the Environmental Statement. In relation to 'biodiversity and special sites' a Habitats Regulations Assessment for impacts on the Humber Estuary European Marine Site is being undertaken see **Chapter 9: Nature Conservation (Marine Ecology)**. Measures to address Water Management are covered in **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage.**
IEMA: Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance (Ref 19-2)	
The guidance aids with the identification, assessment and subsequent mitigation of life cycle impacts of GHG emissions throughout the Environmental Impact Assessment (EIA) process.	The approach to assessing the significance of GHG emissions from construction and operation of the Project has been undertaken in accordance with this guidance.
IEMA: Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (Ref 19-3)	
The guidance aids with the assessing of the impacts of climate change within project design.	The approach for assessing the significance of climate change risks on the Project has been undertaken in accordance with this guidance.

Limitations and Assumptions

19.2.5 The information presented in this preliminary assessment reflects that obtained and evaluated at the time of reporting and is based on an emerging design for the Project and the maximum likely extents of land required for its construction and operation to define a reasonable worst case for assessment.

19.2.6 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further through the assessment and consultation processes, and as further research and investigative surveys are completed to fully understand its potential effects.

Study Area

19.2.7 The Study Area for the Lifecycle GHG impact assessment includes:

a. Direct GHG emissions arising within the Site boundary; and

b. Indirect GHG emissions occurring offsite such as embodied carbon in construction materials. It is not known where the materials are sourced therefore this could be global.

19.2.8 The Study Area for the CCR assessment comprises the Site boundary (temporary and completed works).

19.2.9 The Study Area for the ICCI assessment will be set out in the ES.

Assessment Methodology GHG Assessment

Methodology for Determining Baseline Conditions and Sensitive Receptors

19.2.10 The receptor for GHG emissions is the global climate as the effects of GHG emissions are not geographically constrained. All GHG emissions have the potential to result in a cumulative effect in the atmosphere.

19.2.11 For the GHG assessment, the current and future baseline is the 'business as usual' scenario where the Project is not implemented. The baseline typically considers the GHG emissions from the existing site operations and the existing carbon stock within the soil and the above- and below-ground vegetation within the Site. The Site description in **Chapter 2: The Project** has been used to determine the baseline conditions.

Methodology for Determining Demolition, Construction and Operation Effects

19.2.12 The assessment has adopted a project lifecycle approach to identify 'hot spots' of GHG emissions (i.e. the project stage(s) likely to generate the largest amount of GHG emissions) and enable priority areas for mitigation to be identified. This approach is consistent with the principles set out in IEMA guidance (Ref 19-2) and PAS: 2080 (Ref 19-18).

19.2.13 In line with the World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD) GHG Protocol guidelines (Ref 19-20), the lifecycle GHG impact assessment has been reported as tonnes of carbon dioxide equivalent (tCO_2e) and has considered the seven Kyoto Protocol gases:

i. Carbon dioxide (CO_2);
ii. Methane (CH_4);
iii. Nitrous oxide (N_2O);
iv. Sulphur hexafluoride (SF_6);
v. Hydrofluorocarbons (HFCs);
vi. Perfluorocarbons (PFCs); and
vii. Nitrogen Trifluoride (NF_3).

19.2.14 Expected GHG emissions arising from site preparation and construction activities, embodied carbon in materials and operational emissions of the Project have been quantified using a calculation-based methodology as per the following equation and aligned with the GHG Protocol (Ref 19-20):

Activity data x GHG emissions factor = GHG emissions

19.2.15 A set of standard data quality principles have been applied so that the results from the GHG assessment are as accurate and representative as possible. This has included the selection of emission factors that are representative of the UK

construction industry. GHG activity data has been gathered directly from the Project's engineering and design teams to enable consistency and completeness of data collection.

19.2.16 The Department for Business, Energy and Industry Strategy (BEIS) 2022 emissions factors (Ref 19-21) and embodied carbon data from the Inventory of Carbon and Energy V3.0 (ICE) (Ref 19-22) have been used as the source of emissions factors for calculating GHG emissions. The resulting carbon footprint has been compared to the existing baseline condition, details of which are provided in **Section 19.3**, to identify the impact of the Project.

19.2.17 Where GHG activity data was unavailable, assumptions and estimations have been developed. Any assumptions, inclusions and exclusions that inform the GHG emissions calculation have been clearly described in the sections below.

19.2.18 In order to assess the potential impacts of GHG emissions arising from the Project, likely activities have been identified and their associated GHG emissions sources have been estimated. Potential activities related to the Project that could cause GHG emission impacts are presented in **Table 19.3**.

Table 19.3 Potential sources of GHG emissions

Lifecycle Stage	Activity	Primary Emission Sources
Pre-construction	On-site pre-construction activity i.e., enabling works, etc.;	GHG emissions from fuel consumption by construction plant and vehicles, generators on-site, and worker commuting
	Transportation and disposal of earthworks/ waste	GHG emissions from transportation and disposal of earthworks/ pre-construction waste
	Land clearance	GHG emissions associated with the loss of carbon stock
Product manufacture	Raw material extraction and manufacturing of products/ materials	Embodied GHG emissions associated with product and material manufacture
	Transport of products/ materials to Site	GHG emissions from fuel consumption of transportation of products and materials to Site
Construction	On-site construction activity	Energy (electricity, fuel, etc.) consumption from plant and vehicles, generators on-site, and material consumption
	Transport of construction workers	Energy (electricity, fuel, etc.) consumption from worker commuting

Lifecycle Stage	Activity	Primary Emission Sources
	Transportation and disposal of earthworks/ waste	GHG emissions from transportation and disposal/treatment of earthworks/ construction waste/. This includes vessel movements associated with dredging and waste disposal in the marine environment.
Operations	Operation of the Project	GHG emissions from energy use, process operations, additional traffic, provision of potable water, and treatment of wastewater
	Transportation and disposal of waste	GHG emissions from transportation and disposal of waste
	Building and grounds maintenance /maintenance of marine environment	GHG emissions associated with replacement materials/products. This includes vessel movements associated with dredging and waste disposal in the marine environment.
	Emissions displacement	Avoided or displaced emissions through use of any renewable energy systems or offsetting
	Landscaping	Changes in GHG emissions/sinks from landscaping and re-vegetation
Decommissioning (of the hydrogen production facility)	Removal and or renewal of the hydrogen production facility part of the Project	GHG emissions arising from fuel consumption for plant and vehicles and disposal of materials.

Lifecycle GHG Impact Assessment Significance Criteria

Sensitivity of receptor

19.2.19 The sensitivity of the climate to GHG emissions is considered to be ‘high’. The rationale is as follows:

a. GHG emission impacts could compromise the UK’s ability to reduce its GHG emissions and therefore the ability to meet its future legally binding carbon budgets;

b. The importance of limiting global warming to below 2 °C above industrial levels, while pursuing efforts to limit such warming to 1.5 °C as set out in the Paris Agreement (Ref 19-23) and a recent report by the Intergovernmental Panel on Climate Change (IPCC) (Ref 19-24) highlighted the importance of limiting global warming below 1.5 °C; and

c. Disruption to the global climate is already having diverse and wide-ranging impacts to the environment, society, economic and natural resources. Known effects of climate change include increased frequency and duration of extreme weather events, temperature changes, rainfall and flooding, and sea level rise and ocean acidification. These effects are largely accepted to be negative, profound, global, likely, long-term to permanent, and are transboundary and cumulative from many global actions.

Magnitude of impact

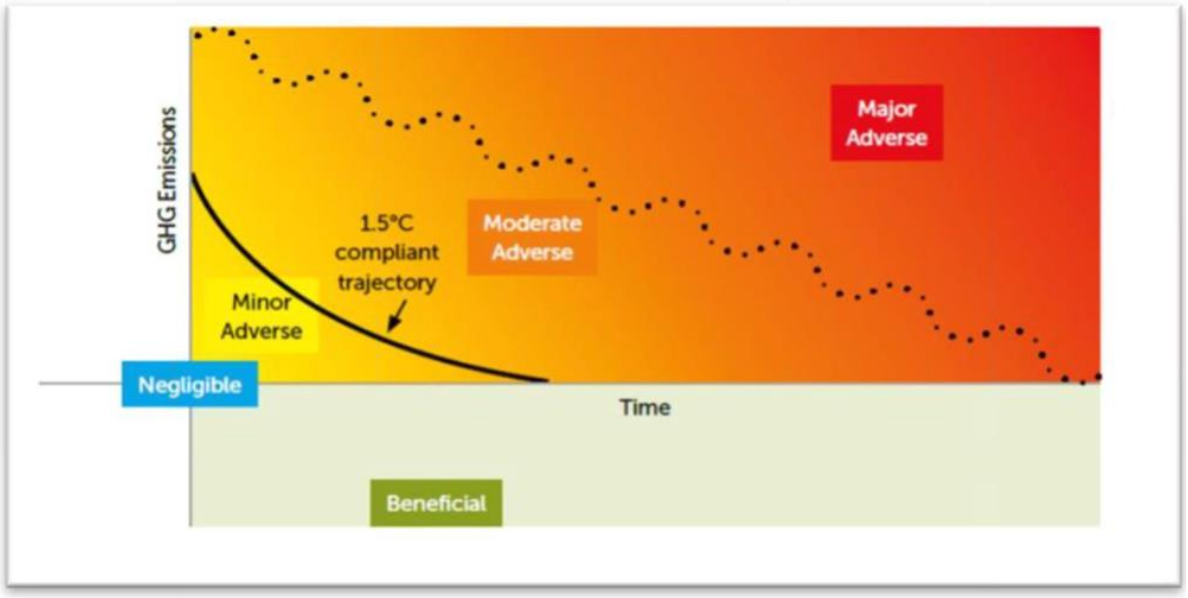
19.2.20 On 28th February 2022, IEMA (Ref 19-2) published a revision of the 2017 IEMA guidance on Assessing Greenhouse Gas Emissions and Evaluating their Significance. The revision of the guidance has been driven by changes arising from legislation and policy since 2017.

19.2.21 IEMA's publication provides updated and improved guidance, developed by leading practitioners from the past five years of practice on complex projects. The guidance builds on the previous IEMA guidance and reinforces the need to use competent experts for specialist topics such as GHG assessment.

19.2.22 In the revised guidance, mitigation is no longer an element to be considered towards the later stage of EIA process. Instead, mitigation should be considered from the outset and throughout the project's lifetime whilst also helping to deliver proportionate EIAs. Once the magnitude of emissions has been determined, mitigation measures should be proposed. Any mitigation measures that are committed to within a proposed development need to be included within the assessment.

19.2.23 The updated guidance describes five distinct levels of significance which are not solely based on whether a project emits GHG emissions, but also how the project makes a relative contribution towards achieving a science-based 1.5°C aligned transition towards net zero. The different levels of significance are plotted against the UK's net zero compatible trajectory as presented in **Plate 19-1** to determine the Project’s significance.

Plate 19-1 Different levels of significance plotted against the UK's net zero compatible trajectory



19.2.24 **Table 19.4** presents the different significance levels as per the latest version of IEMA guidance. The guidance emphasises that *"a project that follows* a *'business-as-usual' or 'do minimum' approach and is not compatible with the UK's net zero trajectory, or accepted aligned practice or area-based transition targets, results in a significant adverse effect. It is down to the practitioner to differentiate between the 'level' of significant adverse effects e.g. '**moderate'** or '**major'** adverse effects."* Moderate and Major adverse impacts are considered to be significant, while all other significance levels are deemed to be not significant.

19.2.25 A 'minor adverse' or 'negligible' non-significant effect conclusion does not necessarily refer to the magnitude of GHG emissions being carbon neutral (i.e. zero on balance) but refers to the likelihood of avoiding severe climate change, aligning project emissions with a science-based 1.5°C compatible trajectory and achieving net zero by 2050.

19.2.26 A project's impact can shift from significant adverse to non-significant effects by incorporating mitigation measures that substantially improve on business-as-usual and meet or exceed the science-based emissions trajectory of ongoing but declining emissions towards net zero.

Table 19.4 Definition of levels of significance (Ref 19-2)

Effects	Significance Level	Description	Example in the guidance
Significant adverse	Major adverse	A project that follows a 'business-as-usual' or 'do minimum' approach and is not compatible with the UK's net zero	The project's GHG impacts are not mitigated or are only compliant with do-minimum standards set

Effects	Significance Level	Description	Example in the guidance
		trajectory, or accepted aligned practice or area based transition targets. It is down to the practitioner to differentiate between the 'level' of significant adverse effects e.g. 'moderate' or 'major' adverse effects.	through regulation, and do not provide further reductions required by existing local and national policy for projects of this type. A project with major adverse effects is locking in emissions and does not make a meaningful contribution to the UK's trajectory towards net zero.
	Moderate adverse		The project's GHG impacts are partially mitigated and may partially meet the applicable existing and emerging policy requirements but would not fully contribute to decarbonisation in line with local and national policy goals for projects of this type. A project with moderate adverse effects falls short of fully contributing to the UK's trajectory towards net zero.
Not significant	Minor adverse	A project that is compatible with the budgeted, science based 1.5°C trajectory (in terms of rate of emissions reduction) and which complies with up-to-date policy and 'good practice' reduction measures to achieve that. It may have residual emissions but is doing enough to align with and contribute to the relevant transition scenario, keeping the UK on track towards net zero by 2050 with at least a 78%	The project's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type. A project with minor adverse effects is fully in line with measures necessary to achieve the UK's trajectory towards net zero.

Effects	Significance Level	Description	Example in the guidance
		reduction by 2035 and thereby potentially avoiding significant adverse effects.	
	Negligible	A project that achieves emissions mitigation that goes substantially beyond the reduction trajectory, or substantially beyond existing and emerging policy compatible with that trajectory and has minimal residual emissions. This project is playing a part in achieving the rate of transition required by nationally set policy commitments.	The project's GHG impacts would be reduced through measures that go well beyond existing and emerging policy and design standards for projects of this type, such that radical decarbonisation or net zero is achieved well before 2050. A project with negligible effects provides GHG performance that is well 'ahead of the curve' for the trajectory towards net zero and has minimal residual emissions.
Beneficial	Beneficial	A project that causes GHG emissions to be avoided or removed from the atmosphere. Only projects that actively reverse (rather than only reduce) the risk of severe climate change can be judged as having a beneficial effect.	The project's net GHG impacts are below zero and it causes a reduction in atmospheric GHG concentration, whether directly or indirectly, compared to the without-project baseline. A project with beneficial effects substantially exceeds net zero requirements with a positive climate impact.

19.2.27 As noted previously, it is down to the practitioner's professional judgement on how best to contextualise a project's GHG impact. In GHG accounting, it is considered good practice to contextualise emissions against pre-determined carbon budgets. The UK has defined national carbon budgets, which have been determined as being compatible with net zero and international climate commitments.

19.2.28 To assess the impact of GHG emissions from the Project, the UK carbon budgets (Ref 19-25) have been used as a proxy for the climate (**Table 19.5**). As this is a NSIP, placing the Project into this context is deemed appropriate. UK carbon

budgets are in place to restrict the amount of GHG emissions the UK can legally emit in a five-year period. The UK is currently in the 3rd carbon budget period, which runs from 2018 to 2022. The 3rd, 4th and 5th Carbon Budgets reflect the previous 80% reduction target by 2050. The 6th carbon budget aligns with the legislated 2050 net zero commitment.

19.2.29 To put future emissions from the Project into context with UK's trajectory to net zero by 2050, the Climate Change Committee's (CCC) balanced net zero pathway is utilised post-2037, in the absence of any nationally legally binding Carbon Budgets after the subsequent 6th Carbon Budget.

19.2.30 The CCC balanced net-zero pathway is divided into 5-year periods post-2037 to match the previous six legally binding UK National Carbon Budgets. The proposed Carbon Budget periods derived from the net-zero pathway encompass the 7th, 8th and 9th indicative budget periods up to 2050 in line with the UK's 1.5-degree trajectory as detailed in **Table 19.5**.

19.2.31 However, it should be noted that the supplementary Carbon Budgets beyond 2037 have not been formally adopted by the Government or ratified by parliament and can only be used as an indicative measure to contextualise the Project's progress compared to the national net-zero trajectory.

19.2.32 While national carbon budgets can provide context on the scale of the Project's GHG emissions, this assessment appraises significance of effects based on the combined measures of embedded mitigation, the emissions trajectory, and policy alignment of the Project (**Table 19.10**).

Table 19.5: UK Carbon Budgets and indicative UK carbon budgets based upon the CCC's balanced net-zero pathway

Carbon budget	UK Carbon Budget ($MtCO_2e$)	Indicative Carbon Budgets based upon the CCC's balanced net-zero pathway ($MtCO_2e$)
3rd (2018-2022)	2,544	-
4th (2023-2027)	1,950	-
5th (2028-2032)	1,725	-
6th (2033-2037)	965	-
7th (2038-2042)	-	526
8th (2043-2047)	-	195
9th (2048-2050)		17

Limitations of the Lifecycle GHG Impact Assessment

19.2.33 The information gathered to date is considered sufficient to provide the basis for an EIA. However, the assessment has taken into consideration assumptions and

limitations, as outlined in **Table 19.6**. For each limitation, an explanation of the possible impact of the limitation has been provided, as well as a description of any corrective actions that will be taken to adjust for any limitations.

Table 19.6 Limitations within the Lifecycle GHG Impact Assessment

Limitation	Impact of limitation	Correction for limitation
The GHG impact assessment is taking place before detailed design is completed and construction has begun. There will be some uncertainty regarding the types and quantities of materials to be used in construction, which will require assumptions to be agreed.	The construction emissions estimate may not reflect the final detailed design. Planning for the construction phase will continue to develop, and some items may not be included within the final data, which will be used for the assessment presented in the ES.	Some items may not be included within the assessment if these materials and their volumes have not been quantified at this stage of the design process. However, professional judgement and a precautionary approach to emissions quantification has been used.
There is currently no specific guidance specifying a quantified threshold of carbon emissions, which if exceeded, is considered significant.	Assessment of significance of emissions cannot be judged objectively.	The assessment has used a combination of approaches. The GHG emissions will be put into context using the national carbon budgets. In addition to this, using the latest version of IEMA guidance (Ref 19-2) the significance of emissions will be assessed based on "*whether the Proposed Development contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050"*.

19.2.34 Some details of the construction methodology of the Project have not been finalised at this stage. As a result, some data is not available to provide a fully quantified assessment of the GHG emissions from the enabling / construction and operation of the Project. Accordingly, appropriate industry estimates and averages have been used for the purposes of this preliminary assessment, all of which are detailed below. These preliminary values will be reviewed and updated accordingly in the ES.

19.2.35 Data was not available for the enabling works and construction works separately. Instead, the GHG emissions presented represent both the enabling and construction work phases.

Assumptions made in the Lifecycle GHG Impact Assessment

19.2.36 The following assumptions, inclusions and exclusions, made on a precautionary basis, have been used in the calculation of GHG emissions for the enabling works and construction phase:

a. Materials quantities were provided by the design team to inform the quantified GHG assessment for the Project. Included in these quantities were a number of assumptions (e.g., mileage incurred by worker transport, energy usage for buildings) which were incorporated into the GHG assessment. These assumptions were based on the design information at the time this assessment was undertaken.

   i. The assumed distance for worker transport for the jetty construction is 50km round-trip per worker. Assumptions for worker transport for the hydrogen production facility have been made in respect of total number of workers per phase, local-non-local split, distance travelled; it is assumed all transport for all workers would be by an average petrol car.

   ii. The assumption for operational workers commuting is that half of workers would be local (25 miles round-trip) and half would be distant (50 miles round trip). Transportation mode is assumed to be by an average petrol car.

   iii. The central assumption for shipping transport is that the total annual volume of imports would be the jetty capacity of approximately 15,000,000 tonnes. For the purposes of this assessment and based on the likely import and re-export profiles for Air Products, it is assumed in this assessment that imports would be from three origins (Saudi Arabia, Oman, and Rotterdam) with domestic (UK) re-export likely to occur to three port destinations (Teesport, Port Talbot, Cardiff) with an assumed 5,000,000 re-exported to the furthest distance port (Cardiff). All distances travelled are assumed as one-way only, with ship fuel type assumed as Liquefied Petroleum Gas. The future origins and destinations are however likely to vary substantially based on individual future jetty users and their patterns of operation and this will be further considered in the ES, if more information on future users becomes available.

   iv. Road transport: assumptions are based on the distance construction materials are likely to be transported to the site on estimates provided by Air Products. Specific distances were provided for different types of materials ranging from 10km (e.g. pipe supports, gravel) to 3000km (shipping equipment).

b. These assumptions will be revisited and reported within the ES as the design of the Project develops.

Assessment Methodology CCR Assessment

Methodology for Determining Baseline Conditions and Sensitive Receptors

19.2.37 The receptor for the CCR review is the Project itself, including workers and infrastructure.

19.2.38 The current baseline has been established by understanding the historic/current climate in the location of the Project by reviewing climate data obtained from the Met Office website. The climate baseline has been developed using Met Office

data obtained from a meteorological station closest to the Site (Cleethorpes) (Ref 19-16).

19.2.39 The future baseline has been established using 2018 United Kingdom Climate Change Projections (UKCP18) (Ref 19-19). UKCP18 data for the 25km grid cell where the Project is located have been used to examine future climate parameters. This climate projection data provides a probabilistic indication of how global climate change is likely to affect the site of the Project using defined climate variables and time periods.

Methodology for Determining Demolition, Construction and Operation Effects

19.2.40 Climate parameters to be considered in the CCR assessment during the demolition, construction and operation of the Project include the following:

a. Extreme weather events;
   i. Flood risk;
   ii. Sea level rise (SLR);
   iii. Temperature change; and
   iv. Rainfall change.

19.2.41 The CCR assessment has qualitatively reviewed the Project resilience to climate change considering the UKCP18 projections (Ref 19-17) for the geographical location and timeframe of the Project (including demolition, construction and operation).

19.2.42 The CCR assessment has been undertaken for the Project to identify potential climate change impacts on the Project and associated receptors, and to consider their potential consequence and likelihood of occurrence, taking account of the measures incorporated into the design of the Project.

19.2.43 Climate change projections for the Site during the enabling works and construction phase have been examined against receptors during this stage. Construction phase receptors of the Project include the workforce, plant, machinery and materials.

19.2.44 As the enabling works and construction phase is relatively short from a climatic perspective and is expected to occur in the immediate future, it is not anticipated that there will be any significant impacts during the enabling works and construction, the CCR review therefore focusses on the operational phase.

19.2.45 For the operational phase of the Project, potential climate change impacts have been identified using relevant projections from UKCP18 and the CCR assessment considers their potential consequence to receptors and likelihood of occurrence, taking account of the measures incorporated into the design of the Project. Receptors when the Project is complete may include the Project assets and their operation, maintenance and refurbishment.

19.2.46 The following key terms and definitions relating to the CCR assessment have been used:

a. Climate hazard – a weather or climate related event, which has potential to do harm to environmental or community receptors or assets, for example, increased winter precipitation;

b. Climate change impact – an impact from a climate hazard which affects the ability of the receptor or asset to maintain its function or purpose; and

c. Consequence – any effect on the receptor or asset resulting from the climate hazard having an impact.

19.2.47 A stepped approach is used to assess the impacts of climate change on the Project.

a. Identify climate hazard;

b. Identify likelihood of climate impact occurring;

c. Identify consequence of impact on the Project; and

d. Identify significance of impact (likelihood of impact occurring x consequence of impact).

19.2.48 Potential climate hazards are identified based on data extracted from UKCP18 for the climate parameters identified in **Paragraph 19.2.40**.

19.2.49 The criteria which have been used to determine the likelihood of a climate change hazard occurring are detailed in **Table 19.7** and **Table 19.8.** The event is defined as the climate event (such as heatwave), while the hazard is defined as an impact on the Project caused by the climate event (such as overheated electrical equipment).

Table 19.7 Probability of Likelihood of Climate Change Hazard Occurring

Likelihood of event	Description (probability of occurrence)
High	90-100% probability that the hazard will occur.
Moderate	33-90% probability that the hazard will occur.
Low	10-33% probability that the hazard will occur.
Negligible	0-10% probability that the hazard will occur.

Table 19.8 Description for the likelihood of the climate-related impact occurring

Likelihood category	Description
High	Likelihood of climate hazard occurring is high and impact is always/ almost always going to occur.
Moderate	Likelihood of climate hazard occurring is moderate and impact of the climate hazard is as unlikely as it is likely to occur.
Low	Likelihood of climate hazard occurring is low, impact rarely occurs.

Likelihood category	Description
Negligible	All other eventualities - highly unlikely but theoretically possible.

19.1.50 Following identification of the likelihood of the climate impact occurring, the consequences of the impact have been assessed according to **Table 19.9.** The categories and descriptions provided below are based on the IEMA climate change resilience and adaptation guidance (Ref 19-3).

19.1.51 The PEI Report presents mitigation measures (based on those identified by each technical discipline) to demonstrate how the Project will be adapted to increase its resilience to future climate conditions.

Table 19.9 Description of consequences

Consequence of impact	Description
High	Significant disruption to construction and operations, unable to deliver services, resulting in high financial losses.
Moderate	Disruption to construction and operations and ability to deliver services, resulting in some financial losses/ cost implications.
Low	Minor disruption to construction and operations but does not significantly impact ability to deliver services.
Negligible	Negligible disruption to construction and operations, does not impact ability to deliver services.

CCR Assessment Significance Criteria

19.1.52 The CCR Review has assessed the significance of effects by evaluating the combination of the likelihood of the climate-related impact occurring, and the consequence, as per the risk assessment matrix in **Table 19.10**. The assessment has taken into account confirmed design and mitigation measures (referred to as embedded mitigation).

19.1.53 Following identification of climate hazards, the likelihood and consequences have been assessed according to **Table 19.8** and **Table 19.9** respectively. The categories and descriptions provided below are based on the IEMA climate change resilience and adaptation guidance (Ref 19-3).

Table 19.10 Significance of effect matrix (where 'S' is significant and 'NS' is not significant)

		Likelihood of climate-related impact occurring			
		Negligible	**Low**	**Moderate**	**High**
Measure of **consequence**	Negligible	NS	NS	NS	NS
	Low	NS	NS	NS	S
	Moderate	NS	NS	S	S
	High	NS	S	S	S

Limitations of the Lifecycle CCR Assessment

19.1.54 The information gathered to date is considered sufficient to provide the basis for an EIA. However, the assessment has taken into consideration assumptions and limitations, as outlined in **Table 19.11**. For each limitation, an explanation of the possible impact of the limitation has been provided, as well as a description of any corrective actions that will be taken to adjust for any limitations.

Table 19.11 Limitations within the CCR Assessment

Limitation	Impact of limitation	Correction for limitation
The CCR assessment is taking place before detailed design is completed and construction has begun. There will be some uncertainty regarding the selection of materials and design to be used for the Project, which will require assumptions to be agreed.	A full assessment based on final designs will not be possible for the PEIR. However, it is possible to consider the impacts of climate change taking into account the location and type of Project.	The impact of climate change on the Project will continue to be evaluated as the design progresses. The climate resilience assessment will be updated for the final assessment presented in the ES.

19.1.55 Data was not available for the enabling works and construction works separately. Instead, the CCR emissions presented represent both the enabling and construction work phases.

19.2 Baseline Conditions

Current Baseline

Lifecycle greenhouse gas (GHG) impact assessment

19.2.1 The current baseline for the lifecycle GHG impact assessment is a 'business as usual' scenario where the Project does not go ahead.

19.2.2 The existing site conditions are explained in **Chapter 2: The Project.** The terrestrial parts of the Site are a mosaic of brownfield uses and former arable land. There is also woodland present, at least some of which will need to be

removed to form the jetty access road and the pipeline to the jetty. Data to assess the carbon sequestration loss (such as from tree loss) was not available for the PEI Report. This will be considered further in the ES.

19.2.3 Emissions from the operation of the existing site are negligible. The current operational baseline has assumed zero emissions.

CCR Assessment

19.2.4 The baseline for the CCR assessment considers how resilient the Project is to current and projected future climate hazards.

19.2.5 The existing baseline for the CCR assessment is based on climate data obtained from the Met Office recorded by the closest meteorological station to the Project (namely Cleethorpes, located approximately 10 miles from the Project) for the period 1981-2010 (Ref 19-16) (refer to **Table 19.12**).

Table 19.12 Climate Data for the Climate Station: Cleethorpes (1981-2010) (Ref 19-16)

Climatic Variable	Month	Value
Average annual maximum daily temperature (°C)	-	13.6
Warmest month on average (°C)	July, August	20.7
Coldest month on average (°C)	January	7.4
Mean annual rainfall levels (mm)	-	587.9
Wettest month on average (mm)	November	60.2
Driest month on average (mm)	February	38.0

ICCI Assessment

19.2.6 The baseline for the ICCI assessment is founded upon the climate data detailed in the CCR assessment combined with the baseline for topic assessments.

Future Baseline

Lifecycle GHG impact assessment

19.2.7 The future baseline for the lifecycle GHG impact assessment is a ‘business as usual’ scenario where the Project does not go ahead. As described under current baseline above, emissions from the Site are currently negligible. The future GHG baseline has therefore been assumed to be zero.

CCR Assessment

19.2.8 The future baseline is based on future UK Climate Projection 2018 (UKCP18) data from the Met Office (Ref 19-19). This projection data provides probabilistic

indications of how global climate change is likely to affect areas of the UK using pre-defined climate variables and time periods.

19.2.9 For the purpose of the assessment, UKCP18 probabilistic projections for pre-defined 30-year periods for the following average climate variables have been obtained and analysed:

a. Mean annual temperature;
b. Mean summer temperature;
c. Mean winter temperature;
d. Maximum summer temperature;
e. Minimum winter temperature;
f. Mean annual precipitation;
g. Mean summer precipitation;
h. Mean winter precipitation; and
i. Sea Level Risk (SLR).

19.2.10 Projected temperature and precipitation variables are presented in **Table 19.13**, **Table 19.14** and **Table 19.15**, respectively. UKCP18 probabilistic projections (RCP 8.5) have been analysed for the 25km grid square in which the Project is located. These figures are expressed as temperature/precipitation anomalies in relation to the 1981-2000 baseline.

Table 19.13 Projected Changes in Temperature Variables (°C), 50% Probability (10% and 90% probability in parentheses)

Climate Variable	Time Period	
	2020-2049	2040-2069
Mean annual air temperature anomaly at 1.5 m (°C)	1.04 (0.49, 1.61)	1.82 (0.95, 2.73)
Mean summer air temperature anomaly at 1.5 m (°C)	1.25 (0.45, 2.02)	2.20 (0.99, 3.41)
Mean winter air temperature anomaly at 1.5 m (°C)	0.92 (0.17, 1.72)	1.62 (0.49, 2.82)
Maximum summer air temperature anomaly at 1.5 m (°C)	1.37 (0.28, 2.37)	2.39 (0.85, 3.95)
Minimum winter air temperature anomaly at 1.5 m (°C)	0.94 (0.11, 1.87)	1.72 (0.42, 3.14)

Table 19.14 Projected Changes in Precipitation Variables (%), 50% Probability (10% and 90% probability in parentheses)

Climate Variable	Time Period	
	2020-2049	2040-2069
Annual precipitation rate anomaly (%)	0.50 (-6.63, 7.52)	-2.36 (-11.3, 6.73)
Summer precipitation rate anomaly (%)	-4.04 (-21.43, 14.36)	-14.31 (-36.47, 8.49)
Winter precipitation rate anomaly (%)	4.13 (-4.29, 13.37)	7.32 (-4.23, 20.52)

Table 19.15 Projected Changes in Sea Level Variables, 50% Probability (10% and 90% probability in parentheses)

Climate Variable	Time Period	
	2020-2049	2040-2069
Time mean sea level anomaly (m)	0.18 (0.13, 0.23)	0.29 (0.22, 0.41)

19.2.11 UKCP18 uses a range of possible scenarios, classified as Representative Concentration Pathways (RCPs), to inform differing future emission trends. These RCPs *"… specify the concentrations of greenhouse gases that will result in total radiative forcing increasing by a target amount by 2100, relative to preindustrial levels."* RCP8.5 has been used for the purposes of this assessment as a worst-case scenario.

19.2.12 Total radiative forcing is the difference between the incoming and outgoing radiation at the top of the atmosphere. Radiative forcing targets for 2100 have been set at 2.6, 4.5, 6.0 and 8.5 watts per square metre (W m-2) to span a wide range of plausible future emissions scenarios and these targets are incorporated into the names of the RCPs; RCP2.6, RCP4.5, RCP6.0 and RCP8.5. Each pathway results in a different range of global mean temperature increases over the 21st century.

19.2.13 The CCR assessment has considered scenarios that reflect a high level of GHG emissions at the 10%, 50%, and 90% probability levels of the climate variables up to 2069 to assess the impact of climate change over the lifetime of the Project.

19.2.14 It is generally concluded that extreme weather events, including intense and / or prolonged precipitation, storm events and poor sea conditions, will increase in frequency, but the low confidence in the climate change projections means that it is difficult to predict the likely changes with confidence (Ref 19-17). Under the

assumptions adopted for this assessment, it is considered that extreme weather will become more frequent.

19.3 Design, Mitigation and Enhancement Measures

Lifecycle GHG impact assessment

Embedded Mitigation Measures

19.3.1 The Project has been designed, as far as possible, to avoid and minimise impacts and effects to population and health through the process of design development, and by embedding mitigation measures into the design. One of the key drivers for the Project is to assist the UK in meeting its net zero targets through the production and distribution of green hydrogen to help decarbonise the transportation sector and to help facilitate the use of carbon capture and storage.

Additional Mitigation Measures

19.3.2 Use of mitigation measures to avoid or minimise operational emissions could include the following listed below. The appropriate measures will be developed and assessed further and included in the ES as relevant:

a. Future transition of Very Large Gas Container (VLGC) fleet to sustainable low carbon fuels over time (over the long term, a similar transition can be expected across the wider marine fleet, to include similar vessels in the carbon capture sector);

b. Energy and heat/ cold integration measures including potential reuse of process tail gas as fuel;

c. Use of best available techniques for energy management as part of the Environmental permit including:

   i. Plant advanced control and optimisation;

   ii. Use of insulation and superinsulation to minimise heat leak into the system;

   iii. Predictive maintenance systems to ensure optimal compressor and equipment running;

   iv. All plant at the installation will be subject to the preventative maintenance programme which ensures that operational efficiency is maintained;

   v. High integrity plan to minimise fugitive emissions; and

   vi. High plant reliability for optimal plant performance reducing start up and shut down;

d. Use of energy efficient lighting;

e. Future use of biogas and or hydrogen to replace natural gas fuel; and

f. Use of Advanced fleet scheduling and supply chain optimisation for distribution will reduce the impact of vehicle movements.

CCR assessment

Embedded Mitigation Measures

19.3.3 The Project has been designed, as far as possible, to avoid and minimise impacts and effects of climate change through the process of design development, and by embedding mitigation measures into the design.

19.3.4 The following embedded mitigation measures are currently being considered as part of the design development of the Project and will be confirmed as part of the Flood Risk Assessment (FRA) (to be prepared and submitted with the DCO Application):

a. Finished floor levels set in line with the Strategic Flood Risk Assessment (SFRA) at 300mm above the Critical Flood Level (i.e. above a level that doesn't result in additional loss of life or damage to property);

b. Flood resilient and resistant design measures; and

c. Ensuring the Site receives Environment Agency Flood Warning Service announcements.

Additional Mitigation Measures

19.3.5 All new assets, structures and buildings will either be designed for projected climatic conditions e.g. increased average temperatures using appropriate design guidance where available, or adaptive capacity will be built into the designs.

19.3.6 Additional mitigation measures are being considered as part of the design development of the Project:

a. Storm-proof infrastructure will be incorporated where possible (e.g., underground power supplies); and

b. Use of materials with superior properties which offer increased tolerance to high temperatures to be considered.

Standard Mitigation Measures

19.3.7 A risk assessment of severe weather impacts on the construction process will, in due course, be produced by the main contractor to inform the need for construction mitigation measures. Any receptors and/or construction-related operations and activities potentially sensitive to severe weather events will be considered in the assessment. Climate change projections will be considered in the risk assessments.

19.3.8 The main contractors' Environmental Management System (EMS) will consider all measures deemed necessary and appropriate to manage severe weather events and should as a minimum cover training of personnel and prevention and monitoring arrangements. These could include:

a. Use of storm defences (e.g., walls, riprap);

b. Design site with refuges, storm-resilient materials and form; and

c. Ensure appropriate storage of plant and materials.

19.3.9 As appropriate, construction method statements will also consider severe weather events where risks have been identified.

19.3.10 Prevention measures and health and safety plans will be developed to prevent worker exhaustion due to heat, manage flood risk during construction.

19.3.11 Regular maintenance of assets will be undertaken to detect deterioration and damage.

19.4 Preliminary Assessment of Effects and Significance

Lifecycle GHG Impact Assessment

19.4.1 When assessing the GHG impacts of the Project consideration has been given only to the direct impacts of the Project. The preliminary assessment has identified that construction and operation will potentially result in **minor adverse**, **not significant**, impacts on the climate.

19.4.2 While the preliminary assessment has only quantified the direct GHG impacts from the construction and operation of the Project, these effects need to be considered in the context of the wider benefits of the Project over its lifetime in helping the UK to achieve its net zero ambitions. The impact of constructing and operating the Project will be far outweighed by the carbon reduction benefits the Project will bring in its contribution to the UK achieving its net zero targets by 2050.

Effects during Construction

19.4.3 The construction works are divided into two parts, terrestrial and marine anticipated to last a total of 11 years. The terrestrial components are anticipated to be constructed in phases and comprise land-side infrastructure (pipeline areas, liquid storage tanks, converters and other supporting infrastructure). The marine components include a jetty of up to two berths, to be constructed over four years. Details of the construction plans can be found in **Chapter 2: The Project** (PEI Report Volume II).

19.4.4 In order to assess the magnitude of the impact of the Project on the climate, GHG emissions associated with the construction of the Project have been calculated based on the methodologies discussed in **Section 19.2**.

19.4.5 As detailed in **Table 19.16**, the total GHG emissions estimated to be emitted from the 11-year construction period associated with the Project have been calculated to be 551,095 tCO_2e. The construction programme is set out in **Chapter 2: The Project** and it is assumed all of the phases, both marine and terrestrial, are built out in accordance with that programme. For the purpose of putting emissions into context with carbon budget periods, construction emissions have therefore been averaged out per annum. Average annual emissions are expected to be 42,811tCO_2e for terrestrial construction and 26,723tCO_2e for marine construction.

19.4.6 All these emissions are considered 'additional' and are included in the impact assessment of the Project. They are defined as additional as they are considered new and would not occur if the Project did not go ahead.

19.4.7 The majority of both terrestrial and marine component GHG emissions (approximately 78% and 77% respectively) are associated with embodied carbon in construction materials.

Table 19.16 Enabling Works and Construction Estimated GHG Emissions

Emission Source	Terrestrial		Marine	
	GHG Emissions (tCO2e)	GHG Emissions as a proportion of emissions generated throughout the construction (11 years)	GHG Emissions (tCO2e)	GHG Emissions as a proportion of emissions generated throughout the construction (3 years)
Preconstruction (A0)	16,797	3.6%	N/A	-
Construction Materials (A1-A3)	366,727	78%	61,627	77%
Transportation of Materials (A4)	12,137	2.6%	1,205	2%
Worker Transport (A4)	13,003	2.8%	846	1%
Waste (A4-A5)	84	0%	6,636	8%
Construction Activities (A5)	62,178	13%	9,856	12%
Total GHG emissions over construction period (tCO2e)	470,926	-	80,170	-
Average annualised GHG emissions during construction (tCO2e)	**42,811**	-	**26,723**	-

Significance of GHG Emissions during Construction

19.4.8 As stated in **Section 19.3**, all GHG emissions are considered to contribute to climate change. To contextualise the level of significance for the Project the total estimated annual GHG emissions during the construction period for both the terrestrial and marine components is compared to the percentage contribution of the annual budget within each Carbon Budget period. With reference to the UK national carbon budgets, the construction programme falls within three carbon

budgets (4th, 5th and 6th), and equates to a small fraction of less than 0.01% for each budget (**Table 19.17**).

Table 19.17 Contribution of Construction GHG Emissions to the UK Carbon Budgets

Carbon Budget	UK Carbon Budget (tCO2e)	Potential Project Emissions (tCO2e)	Percentage Contribution of Construction Emissions to the UK Budget
4th (2023-2027)	2,544,000,000	294,224	0.01%
5th (2028-2032)	1,950,000,000	214,055	0.01%
6th (2033-2037)	1,725,000,000	42,811	0.002%

19.4.9 As discussed in **Section 19.2**, the updated guidance from IEMA should be used when assessing the significance of GHG emissions from the Project. This takes into account the embedded mitigation, the carbon emissions trajectory, and the policy alignment of the Project to gauge overall impact. As noted previously, it is down to the practitioner's professional judgement on how best to contextualise a project's GHG impact.

19.4.10 Based on **Table 19.17**, the significance of construction GHG emissions is considered to be **Minor Adverse** and therefore **not significant**. This means that the Project's GHG impacts would be fully consistent with applicable existing and emerging policy requirements and good practice design standards for projects of this type.

19.4.11 A project with minor adverse effects is in line with measures necessary to achieve the UK's trajectory towards net zero. Given the significant role the Project will play in decarbonising heavy freight transport in the UK, it supports the UK's trajectory towards net zero.

Effects During Operation of Project

19.4.12 Operational energy data was provided by the design team for inclusion in this assessment relating to utilities use during operation of the Project, calculated to be a total of 876,727tCO_2e over an assumed 25-year operating lifespan (see **Table 19.18**).

19.4.13 Additional data was provided for the calculation of emissions from shipping and road transport associated with the Project (see **Table 19.18**). Reasonable assumptions have been used to calculate worker emissions for the Project once it becomes operational.

19.4.14 The majority of emissions (58%) are associated with shipping received by the Project from abroad. For the assessment, the use is assumed of standard petroleum-based fuels to power the delivery tankers. In the future, a gradual switch in the shipping fleet to the use of decarbonised fuel is expected however this has not been included in the GHG assessment. Therefore, this is assumed to

be a worst case scenario, and actual operational emissions are expected to decrease in line with UK policy to decarbonise towards net zero by 2050.

19.4.15 Tonnes of CO_2e emissions reported for Sea Freight Transport imports presented in **Table 19.18** account for total potential shipping use for the proposed terminal over the Project assessment period. This is for all shipping arrivals per annum which is based on the assumption in **Paragraph 19.2.36**. It should be noted however that only 12 ship arrivals per annum will be required for the operation of the proposed hydrogen production facility included in the DCO Application.

Table 19.18 Estimated emissions from operational energy use of Project (25 year period)

Emissions Source	Emissions (tCO_2e)	% of Operation Emissions
B1 - Use		
Sea Freight Transport (Imports) (B1)	1,618,746	33%
Sea Freight Transport (Exports) (B1)	2,153,095	44%
Road Transport (B1)	248,374	5%
B6 – Operational Energy Use		
Operational Energy Use – Port Facilities (Electricity, Gas, Water) (B6) and hydrogen production facility	876,727	17.8%
B9 – Utilisation of infrastructure		
Worker Commuting	12,409	0.2%
Total GHG Emissions (tCO_2e)	**4,909,351**	-
Total GHG Emissions Annualised (tCO_2e)	**196,374**	-

19.4.16 There will be emissions from operational energy use from ships when in port, ammonia processing and maintenance (dredging), however data to calculate these emissions was not available for the PEI Report. This information will be included and assessed in the ES.

Significance of GHG Emissions from Operation

19.4.17 As stated in **Section 19.3**, all GHG emissions are considered to contribute to climate change. To contextualise the level of significance for the Project, these emissions have been compared to UK national carbon budgets (**Table 19.19**).

19.4.18 The total estimated annual GHG emissions during the operational period for both the terrestrial and marine components is compared to the percentage contribution of the annual budget within each Carbon Budget period and assumes all phases of both the NSIP and the hydrogen production facility are

operational in 2035. With reference to the UK national carbon budgets, the period of operation falls within one carbon budget (6th) and equates to a small fraction (of less than 0.1%) of the relevant budget (**Table 19.19**).

Table 19.19 Contribution of Operation GHG Emissions to the UK Carbon Budgets

Carbon Budget	UK Carbon Budget (tCO2e)	Potential Project Emissions (tCO2e)	Percentage Contribution of Construction Emissions to the UK Budget
6th (2033-2037)	1,725,000,000	445,904	0.026%

19.4.19 As discussed in **Section 19.2**, the updated guidance from IEMA should be used when assessing the significance of GHG emissions from the Project. This takes into account the embedded mitigation, the carbon emissions trajectory, and the policy alignment of the Project to gauge overall impact. As noted previously, it is down to the practitioner's professional judgement on how best to contextualise a project's GHG impact.

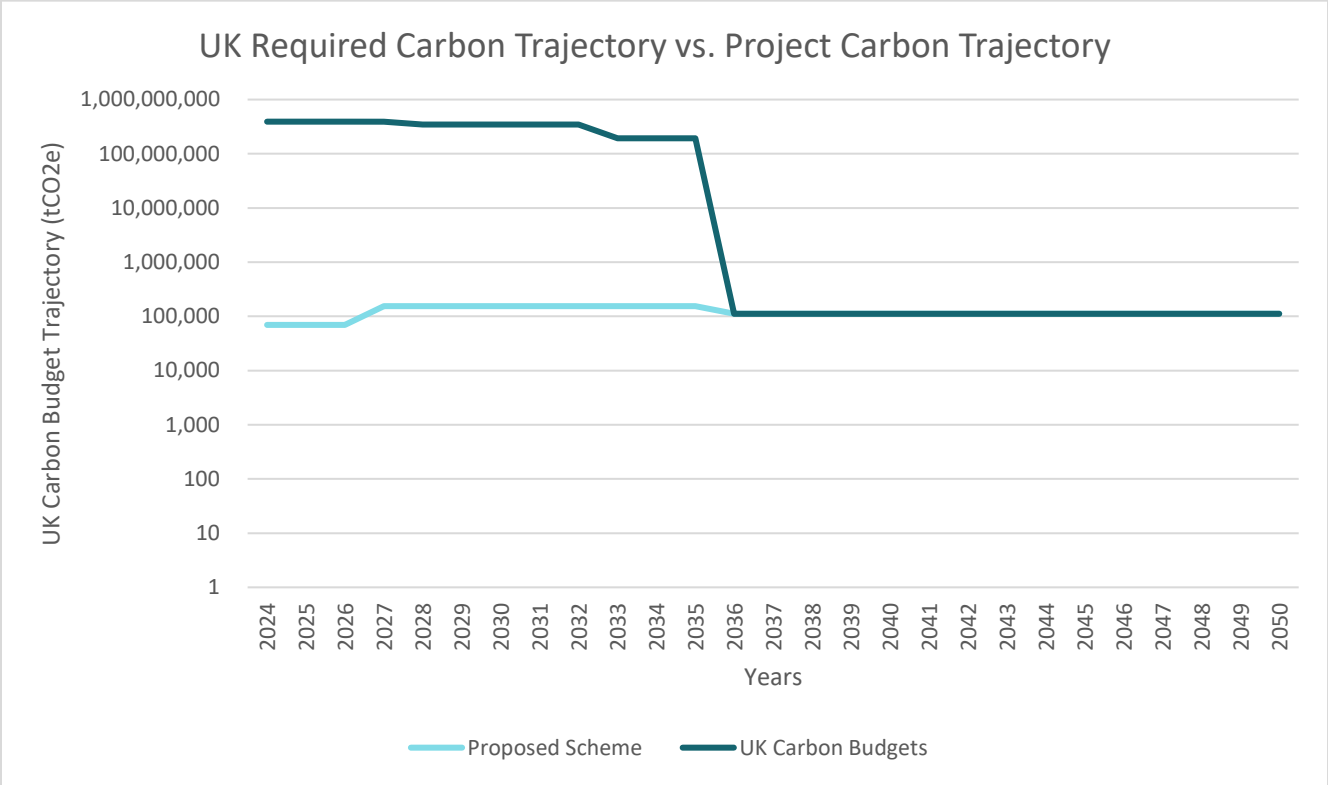
19.4.20 In line with the latest IEMA guidance, the Project emissions trajectory during construction and operation is plotted against the UK's carbon budgets in **Plate 19-2**. The Project demonstrates a decrease in operational emissions over its lifespan, which will likely be greater than indicated if the Project includes adoption of sustainable, low-carbon fuels and other low carbon measures.

19.4.21 Based on **Table 19.4**, it is assessed that the significance of operation GHG emissions is **Minor Adverse** and therefore **not significant**. This appraisal is based on the information available to date and will be updated further once outstanding emissions sources are more fully defined. The updated assessment will be included in the ES.

19.4.22 Project emissions also need to be considered in the context of the potential national emissions reductions the Project will facilitate through decarbonisation of UK transport. The green hydrogen the Project is producing for distribution and use in the UK would contribute towards the UK achieving net zero emissions by 2050, by providing fuel for heavy transport vehicles including HGVs and buses (see **Section 19.6** below). It is considered that the net impacts resulting from the operation-related emissions are minimal and can be further reduced with implementation of appropriate mitigation as outlined in **Section 19.4** , noting also the overall role the project will play in reducing the UK carbon emissions as set out in **Paragraph 19.1.4**.

19.4.23 Further use of the terminal for import of CO_2 for example will also contribute to the UK's net zero aims, as that CO_2 can be captured at source and fed into a carbon capture network for permanent storage.

Plate 19-2 GHG Emissions produced from the Project during construction, plotted against the UK carbon budgets (2024-2035)



Decommissioning

19.4.24 Decommissioning of the NSIP (the jetty) has been scoped out from this assessment. The Project does not make any provision for the decommissioning of the marine facilities of the Project. This is because the marine facilities would, once constructed, become part of the fabric of the Port estate and would, in simple terms, continue to be maintained so that it can be used for port-related activities to meet a long-term need. All plant or equipment on the Jetty topside that is associated with the landside element of the Project would likely remain in situ and repurposed, if possible, to transport other liquid bulks. While it is likely that some GHG emissions would arise as part of the decommissioning of the landside hydrogen production facilities, it is not possible to say with any certainty what they are likely to be. Methods of deconstruction and disposal are not known at this time. It should also be noted that by the time the hydrogen production facilities are decommissioned, the UK will be achieving net zero emissions and therefore any impacts are likely to be reduced.

CCR Review

19.4.25 The preliminary assessment has identified that before adaption measures are introduced, construction and operation of the Project will potentially be subject to adverse impacts from climate change which will arise in any event.

19.4.26 These impacts on the Project are associated with:

a. Increased frequency and severity of extreme weather events;
b. Increased frequency and intensity of heavy precipitation events;
c. Increased summer temperatures; and
d. Sea level rise.

Construction

19.4.27 During enabling works and construction, unless appropriate measures are applied, receptors such as the construction work force, construction plant, vehicles, materials and the construction programme may be vulnerable to a range of climate risks. These could include:

a. Extreme weather events (severe flooding, storms, snow, wind and ice) could impact the site's accessibility, restricting working hours and delaying the construction schedule;
b. Health and safety could be at risk during extreme weather events, potentially resulting in severe injury and/ or death;
c. The higher peak temperatures and increased frequency and intensity of heatwaves, particularly in the summer, could create unsuitable working conditions for construction site workers, plant, and equipment use; and
d. Increased risk of extreme weather events could potentially damage construction materials, plant equipment, assets, and infrastructure.

Operation

19.4.28 During the operation, unless appropriate measures are applied, the Project may be vulnerable to a range of climate risks. These could include:

a. Extreme weather events could impact the site's accessibility, restricting working hours and interrupting the operational schedule;
b. Operational workers' health and safety could be at risk, potentially resulting in severe injury and/ or death from adverse weather;
c. The higher peak temperatures and increased frequency and intensity of heatwaves, particularly in the summer, could create unsuitable working conditions for operational site workers, plant and equipment use;
d. Increased risk of extreme weather events could potentially cause damage to structures (e.g., jetties, buildings) and damage to land-based infrastructure, transport, and floating assets;
e. Extreme weather events could cause disruption to power and water services which may impact the operation of the Project;
f. The increased frequency of extreme weather events might increase the requirement for dredging and maintenance, leading to additional costs;
g. The increased risk in frequency and intensity of heatwaves could potentially result in damaging infrastructure and services through the increased risk of thermal expansion beyond the design tolerance of the materials;

h. Damage to drainage systems, gutters and downpipes due to flooding from intense rainfall; and

i. Potential damage to equipment and infrastructure due to prolonged exposure to high intensity temperatures resulting in overheating of equipment/machinery.

ICCI Assessment

19.4.29 The ICCI assessment identifies how the resilience of various receptors in the surrounding environment (such as local waterways or local heritage assets etc.) are affected by the Project in combination with the future climatic conditions.

19.4.30 The impacts are assessed for the construction and operation of the Project. UKCP18 projections (Ref 19-19) for the geographical location and lifetime of the Project, and the receptors identified by technical specialists, would be used when undertaking this assessment. See **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage**.

19.5 Summary of Preliminary Assessment

GHG assessment

19.5.1 **Table 19.20** and **Table 19.21** provide a summary of the identified construction and operational phase GHG impacts on the climate. IEMA criteria has been used to assess the significance of the impact of GHG emissions from the Project. The assessment concluded that the Project has a **minor adverse, not significant** impact. This aligns with IEMA guidance where emissions from a Project can be considered minor adverse where they are compatible with the budgeted, science based 1.5ºC trajectory and comply with up-to-date policy and good practice. This Project is a part of Government Plans to decarbonise the UK economy and therefore in alignment with policy and good practice.

19.5.2 The Project has a wider context of its role in helping meet the UK's target to achieve net zero emissions by 2050. The Project is anticipated to produce up to 300 MW of hydrogen per annum once fully operational at full capacity, the equivalent of up to 9.5 billion MJ per annum. Depending on market demand, it is estimated that this will meet up to 3% of Government's hydrogen production capacity target.

19.5.3 For context, the use of diesel in road transport results in the emission of approximately 94g CO_2 per MJ, therefore the green hydrogen produced by the Project and used in road transport applications could facilitate a reduction in annual emissions of CO_2 from road traffic emissions by up to 578,000 tonnes from 2030 as a result of fuel switching. An additional benefit of this switch in fuel would be a reduction in emissions of other atmospheric pollutants – namely cutting emissions of particulate (PM_{10}) (26 tonnes /year) and NOx emissions (1050 tonnes/ year), based on replacing vehicles to the latest Euro VI standards. In practice the actual savings could be substantially greater as cleaner engine technologies are developed.

CCR Assessment

Construction

19.5.4 **Table 19.22** provides a summary of the identified construction phase impacts, the adaptation methods to increase the resilience of the Project and likely effects of climate change on the Project.

19.5.5 While the majority of impacts of climate change on the construction of the Project are considered to have a low to moderate impact prior to the inclusion of mitigation measures, following the addition of mitigation, all impacts from climate change on construction are considered to be low and not significant**.**

Operation

19.5.6 **Table 19.23** provides a summary of the identified operational phase impacts, the adaptation methods to increase the resilience of the Project and likely effects of climate change on the Project.

19.5.7 While the majority of impacts of climate change on the operation of the Project are considered to have a low to moderate impact prior to the inclusion of mitigation measures, following the addition of mitigation, all impacts from climate change on operations are considered to be low and not significant.

Table 19.20: GHG Assessment mitigation and significance summary – Construction phase*

Potential impacts on the Climate	Mitigation measures
Increased emissions contributing to climate change	Measures to reduce embodied carbon in construction materials. Examples include: - Prioritising sourcing secondary / recycled materials, particularly for materials with energy-intensive processing (e.g., green steel) - Utilise locally-sourced products and those with higher recycled content wherever feasible - Incorporating recycled content into concrete / replacing cementitious materials with secondary materials (e.g., PFA, GGBS, silica, limestone fines) - Design for minimal waste creation - Reuse site-won materials wherever possible, to minimize the use of natural resources and unnecessary materials (e.g., reclaim waste from enabling works as aggregates/ sub-base) Other measures that would reduce construction-related emissions include: - Liaising with construction personnel to implement staff minibuses and/or car sharing options - Implementing a travel plan to reduce the volume of construction staff trips to the Project, and identify efficiencies to reduce single-person trips - Switching vehicles and plant off when not in use and ensuring all vehicles conform to current EU emissions standards - Pursuing alternatively / renewably powered plant (e.g., biodiesel, hydrogen-powered, battery-powered) - Conducting regular planned maintenance of all operating plant and machinery to optimize efficiency

***Significance criteria not included. IEMA Guidance specifies for Project to achieve Minor Adverse / Not Significant, it must apply good practice measures as presented in this table.**

Table 19.21: GHG Assessment mitigation and significance summary – Operational phase*

Potential impacts on the Climate	Mitigation measures
Increased emissions contributing to climate change	Measures to reduce carbon emissions during operation of the Project could include: - Encouraging the use of lower carbon modes of transport by identifying and communicating local bus connections and pedestrian and cycle access routes to/from the Project to all site staff, as well as providing appropriate facilities for safe storage of cycles - Liaising with relevant personnel to implement staff minibuses and/or car sharing options - Implementing a travel plan to reduce the volume of staff trips to the Project, and identify efficiencies to reduce single-person trips - Switching vehicles and plant off when not in use and ensuring all vehicles conform to current EU emissions standards - Pursuing alternatively / renewably powered plant (e.g., biodiesel, hydrogen-powered, battery-powered) - Conducting regular planned maintenance of all operating plant and machinery to optimize efficiency

***Significance criteria not included. IEMA Guidance specifies for Project to achieve Minor Adverse / Not Significant, it must apply good practice measures as presented in this table.**

Table 19.22 Climate Change Resilience Review Summary: Construction Phase

Potential climate changes	Potential impacts on the Project	Likelihood of climate related impact occurring) (pre mitigation)	Measure of Consequence occurring (Pre mitigation	Significance Level (Pre-Mitigation)	Adaptation / Resilience measures	Likelihood of climate related impact occurring	Measure of Consequence occurring	Significance Level (Post-Mitigation)
Increased frequency and severity of weather events	Limit access to site Restrict working hours Delay construction program Damage to construction materials, plant and equipment	Moderate	Low	Not significant	A risk assessment of severe weather impacts on the construction process will be produced by the main contractor to inform mitigation. Any receptors and/or construction-related operations and activities potentially sensitive to severe weather events will be considered in the assessment. Climate change projections will be considered in the risk assessments. The main contractors' EMS will consider all measures deemed necessary and appropriate to manage severe weather events and will as a minimum cover training of personnel and prevention and monitoring arrangements. As appropriate, construction	Low	Low	Not significant

Potential climate changes	Potential impacts on the Project	Likelihood of climate related impact occurring) (pre mitigation)	Measure of Consequence occurring (Pre mitigation	Significance Level (Pre-Mitigation)	Adaptation / Resilience measures	Likelihood of climate related impact occurring	Measure of Consequence occurring	Significance Level (Post-Mitigation)
					method statements will also consider severe weather events where risks have been identified. Use of storm defenses (e.g., walls, riprap). Design site with refuges, storm-resilient materials and form. Ensure appropriate storage of plant and materials. Addition of wind protection defenses (e.g., storm pin and tie-down procedures, crane buffers) across site. Specific measures to ensure safe storage of larger infrastructure (e.g. quay cranes) Regular maintenance of assets to be undertaken to detect deterioration and damage.			

Potential climate changes	Potential impacts on the Project	Likelihood of climate related impact occurring) (pre mitigation)	Measure of Consequence occurring (Pre mitigation	Significance Level (Pre-Mitigation)	Adaptation / Resilience measures	Likelihood of climate related impact occurring	Measure of Consequence occurring	Significance Level (Post-Mitigation)
Increased summer temperatures	Restrict working hours Delay construction program Weather may create site conditions unsuitable for plant operation (damage,	Moderate	Low	Not significant	Prevention measures and health and safety plans to be developed to prevent worker exhaustion due to heat such as monitoring of the weather to advise on requirements to stop work.	Low	Low	Low (Not significant)
Increased winter precipitation	Viability of and access to construction sites (such as heavy rain resulting in surface water flooding of local roads, sources of power supply or inundation of construction sites).	Moderate	Low	Not significant	Prevention measures and health and safety plans to be developed to manage flood risk during construction such as monitoring of the weather to advise on requirements to stop work.	Low	Low	Not significant

Table 19.23 Climate Change Resilience Review Summary: Operational Phase

Potential climate changes	Potential impacts on the Project	Likelihood of climate related impact occurring (Probability of Occurrence)	Measure of Consequence occurring	Significance Level (Pre-Mitigation)	Adaptation / Resilience measures	Likelihood of climate related impact occurring (Probability of Occurrence)	Measure of Consequence occurring	Significance Level (Post-Mitigation)
Increased frequency and severity of extreme weather	Potentially cause damage to structures and infrastructure.	Moderate	Moderate	Significant	All new structures will either be designed for the climatic conditions using appropriate design guidance where available, or adaptive capacity will be built into the designs.	Moderate	Low	Not Significant
Sea Level Rise	Potentially cause damage to structures and infrastructure	Moderate	Moderate	Significant	All new structures will either be designed for the climatic conditions using appropriate design guidance where available, or adaptive capacity will be built into the designs. Additional design measures to cope with flood / high water level conditions on site	Moderate	Low	Not significant

Potential climate changes	Potential impacts on the Project	Likelihood of climate related impact occurring (Probability of Occurrence)	Measure of Consequence occurring	Significance Level (Pre-Mitigation)	Adaptation / Resilience measures	Likelihood of climate related impact occurring (Probability of Occurrence)	Measure of Consequence occurring	Significance Level (Post-Mitigation)
					will be implemented (see Section 19.6).			
Increased frequency and severity of extreme weather events (e.g. flooding, snow and ice, storms	Potential damage to land-based infrastructure. Disruption to power and water services which may impact the operation of the Project	Moderate	Moderate	Significant	All new assets and buildings will either be designed for the climatic conditions using appropriate design guidance where available, or adaptive capacity will be built into the designs. Storm-proof infrastructure will be incorporated where possible (e.g., underground power supplies). Addition of wind protection defenses (e.g., storm pin and tie-down procedures, crane buffers) across site. Specific measures to ensure safe	Moderate	Low	Not significant

Potential climate changes	Potential impacts on the Project	Likelihood of climate related impact occurring (Probability of Occurrence)	Measure of Consequence occurring	Significance Level (Pre-Mitigation)	Adaptation / Resilience measures	Likelihood of climate related impact occurring (Probability of Occurrence)	Measure of Consequence occurring	Significance Level (Post-Mitigation)
					storage of larger infrastructure (e.g. quay cranes) Regular maintenance of assets to be undertaken to detect deterioration and damage.			
Increased Summer Temperatures	Interrupted power supplies (e.g., overheating, damage to power provision infrastructure). Higher year-round temperatures could increase operational cooling requirements for the equipment and infrastructure.	Low	Low	Not significant	Use of materials with superior properties which offer increased tolerance to high temperatures to be considered.	Low	Low	Not significant

Potential climate changes	Potential impacts on the Project	Likelihood of climate related impact occurring (Probability of Occurrence)	Measure of Consequence occurring	Significance Level (Pre-Mitigation)	Adaptation / Resilience measures	Likelihood of climate related impact occurring (Probability of Occurrence)	Measure of Consequence occurring	Significance Level (Post-Mitigation)
	Potential damage to infrastructure and services through the increased risk of thermal expansion beyond the design tolerance of the materials.							
Increase temperatures	Risk of destabilising chemicals / substances stored on site during operation.	Moderate	Moderate	Significant	Storage and transfer of chemicals/ substances in line with safety regulations.	Moderate	Low	Not significant

ICCI Assessment

19.5.8 The inclusion of a separate ICCI assessment has been scoped out of the Climate Change chapter on the basis that any identified in-combination climate change impacts is addressed, as relevant, in other relevant technical chapters.

19.5.9 The final outcomes of the likely significant effects of the Project on climate change will be reported within the ES.

19.6 References

Ref 19-1 The Town and Country Planning (Environmental Impact Assessment) Regulations 2017.

Ref 19-2 IEMA (2022). Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance.

Ref 19-3 IEMA (2020). Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation.

Ref 19-4 UK Government (2021). The Carbon Budget Order 2021.

Ref 19-5 UNFCCC (2016). Conference of the Parties, Report of the Conference of the Parties on its twenty-first session, held in Paris from 30 November to 13 December 2015.

Ref 19-6 Climate Change Act 2008.

Ref 19-7 Climate Change Committee (2020) The Sixth Carbon Budget - The UK's path to Net Zero.

Ref 19-8 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended by The Town and Country Planning and Infrastructure Planning (Environmental Impact Assessment) (Amendment) Regulations 2018).

Ref 19-9 Department for Transport (2012). National Policy Statement for Ports.

Ref 19-10 Ministry of Housing, Communities and Local Government (MHCLG) (2021). National Planning Policy Framework (NPPF).

Ref 19-11 MHCLG (2014, updated March 2019). National Planning Practice Guidance: Climate Change.

Ref 19-12 Department for Transport. (2021b). Decarbonising transport: a better, greener Britain.

Ref 19-13 North East Lincolnshire Council (2016). Environmental Policy Statement.

Ref 19-14 North East Lincolnshire (2021). Net Zero Carbon Roadmap.

Ref 19-15 North East Lincolnshire Council (2021). Natural Assets Plan.

Ref 19-16 Met Office (2020). Historic Climate Data.

Ref 19-17 Met Office (2018b). UKCP18 Guidance: Caveats and limitations.

Ref 19-18 BSI (2016). Guidance Document for PAS 2080.

Ref 19-19 Met Office (2018). UK Climate Projections (UKCP) 2018.

Ref 19-20 World Resources Institute (WRI) & World Business Council for Sustainable Development (WBCSD) (2004). The GHG Protocol: A Corporate Accounting and Reporting Standard.

Ref 19-21 Department for Business, Energy and Industrial Strategy (2021). Greenhouse gas reporting: conversion factors 2021.

Ref 19-22 ICE Database (2019). Embodied Carbon.

Ref 19-23 UNFCC (2015). Paris Agreement.

Ref 19-24 IPCC (2018). Global warming of 1.5°C - Special Report.

Ref 19-25 Committee on Climate Change (2017). UK Carbon Budgets.

Ref 19-26 Associated British Ports (2022). Immingham Green Energy Terminal ("IGET") Briefing Note.

19.7 Abbreviations and Glossary of Terms

Table 19.24 Glossary and Abbreviations

Term	Acronym	Meaning
Carbon budgets	n/a	UK greenhouse gas targets over defined periods of time.
Carbon Dioxide	CO_2	A colourless, odourless gas produced by burning carbon and organic compounds and by respiration.
Carbon emissions equivalent	CO_2e	Shorthand for emissions of any of the seven greenhouse gases that contribute to climate change.
Carbon footprint	n/a	The total greenhouse gas emissions associated with a particular policy or development.
Celsius	°C	A scale of temperature.
Climate	n/a	Long-term weather conditions prevailing over a region.
Climate change	n/a	This refers to a change in the state of the climate, which can be identified by changes in average climate characteristics which persist for an extended period, typically decades or longer.
Climate Change Resilience	CCR	The resilience of the Project to climate change impacts, including how the design would consider projected impacts of climate change.
Committee on Climate Change	CCC	An independent, statutory body established under the Climate Change Act 2008.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Embodied carbon	n/a	Carbon emissions associated with energy consumption and chemical processes during the extraction, transport and/or manufacture of construction materials or products.
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
Environmental Management System	EMS	A framework for managing and reporting environmental impacts on a Project.
Extreme weather	n/a	A weather event which is significantly different from the average or usual weather pattern.

Term	Acronym	Meaning
Flood Risk Assessment	FRA	The process of assessing potential flood risk to a site and identifying whether there are any flooding or surface water management issues that may warrant further consideration or may affect the feasibility of a project.
Greenhouse Gas	GHG	Atmospheric gases that absorb and emit infrared radiation emitted by the Earth's surface, the atmosphere and clouds.
Heavy Goods Vehicle	HGV	A large truck for transporting goods.
Hydrofluorocarbon	HFC	Hydrofluorocarbons (HFCs) are man-made organic compounds that contain fluorine and hydrogen atoms.
In-Combination Climate Change Impact Assessment	ICCI	The assessment of the combined impact of the Project and potential climate change on the receiving environment.
Institute of Environmental Management and Assessment	IEMA	A professional body for practitioners working in the fields of environmental management and assessment.
Intergovernmental Panel on Climate Change	IPCC	An intergovernmental body of the United Nations, dedicated to providing the world with an objective, scientific view of climate change, its natural, political and economic impacts and risks, and possible response options.
Inventory of Carbon and Energy	ICE	The Inventory of Carbon and Energy is an embodied carbon database for building materials.
Met Office	n/a	The United Kingdom's national weather service.
Methane	CH_4	The main constituent of natural gas, and the second most important greenhouse gas.
Nationally Determined Contribution	NDC	A climate action plan to cut emissions and adapt to climate impacts.
National Planning Policy Framework	NPPF	A planning framework which sets out the Government's planning policies for England and how these are expected to be applied.
National Policy Statement for Ports	NPSfP	The National Policy Statement for Ports provides the framework for decisions on proposals for new port development.
North-East Lincolnshire Council	NELC	Local authority of North-East Lincolnshire.
Nitrous Oxide	N_2O	A gas produced when fuels are burned and is often present in motor vehicle and boiler exhaust fumes. It is an irritant to the respiratory system.

Term	Acronym	Meaning
Nitrogen Trifluoride	NF_3	Nitrogen trifluoride is an extremely strong and long-lived greenhouse gas.
Pressure swing adsorption	PSA	Pressure swing adsorption units use beds of solid adsorbent to separate impurities from hydrogen streams leading to high-purity high-pressure hydrogen and a low-pressure tail gas stream containing the impurities and some of the hydrogen. The beds are then regenerated by depressurizing and purging. Part of the hydrogen (up to 20%) may be lost in the tail gas
Perfluorocarbon	PFC	Perfluorocarbons are man-made compounds containing fluorine and carbon.
Preliminary Environmental Information Report	PEIR / PEI Report	A report that compiles and presents the Preliminary Environmental Information gathered for a project.
Renewable Transport Fuel Obligation	RTFO	The Renewable Transport Fuel Obligation guidance is for fuel suppliers, independent verifiers and others involved in the supply of biofuels in the UK.
Representative Concentration Pathway	RCP	A greenhouse gas concentration (not emissions) trajectory adopted by the IPCC for its fifth Assessment Report in 2014.
Sea Level Rise	SLR	Sea Level Rise is the increase in level of the world's oceans due primarily because of the effects of global warming.
Strategic Flood Risk Assessment	SFRA	A Strategic Flood Risk Assessment looks at flood risk at a strategic level on a local planning authority scale.
Sulphur hexafluoride	SF6	Sulphur hexafluoride is an extremely potent and persistent greenhouse gas that is primarily utilized as an electrical insulator and arc suppressant.
United Kingdom	UK	-
UK Climate Projections	UKCP	The name given to the UK Climate Projections.
Very Large Gas Carrier	VLGC	These carriers are a sub-class of generic gas carriers that target a considerably higher volume of gas transport.
World Business Council for Sustainable Development	WBCSD	A CEO-led community of over 200 of the world's leading sustainable businesses working collectively to accelerate the system transformations needed for a net zero, nature positive, and more equitable future.
World Resources Institute	WRI	A global research organization that turns big ideas into action at the nexus of environment, economic opportunity and human well-being.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 20: Material Assets and Waste

Associated British Ports

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Table of contents

Chapter Pages

Tables

Plates

20 Materials and Waste

20.1 Introduction

20.1.1 This chapter presents the preliminary findings of the assessment of the likely effects of the Project on materials and waste.

20.1.2 This chapter presents an initial baseline for material and waste relevant to the Project and sets out the study area. In addition, the chapter provides an overview of the assessment methodology being followed for the environmental assessment and identifies potential effects identified to date.

20.1.3 This assessment follows the methodology as set out in the Institute of Environmental Management and Assessment's (IEMA) guide to: Materials and Waste in Environment Assessment, Guidance for a Proportionate Approach (referred to herein as the 'IEMA Guidance') (Ref 20-1).

20.1.4 For the purpose of this Preliminary Environmental Information (PEI) Report, materials and waste comprise:

a. The consumption of materials (key construction materials only).

b. The generation and management of waste.

20.1.5 Materials are defined in the IEMA Guidance as "*physical resources that are used across the lifecycle of a development. Examples include key construction materials such as concrete, aggregate, asphalt and steel*."

20.1.6 Other material assets considered include built assets such as landfill void capacity and safeguarded mineral and waste sites.

20.1.7 Waste is defined as per the Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on Waste and Repealing Certain Directives (Waste FD) (Ref 20-2) as "*any substance or object which the holder discards or intends or is required to discard*".

20.1.8 There are some interrelationships between potential effects on materials and waste and other disciplines. Therefore, reference should also be made to **Chapter 21: Ground Conditions and Land Quality** for information potential contaminated land that could give rise to waste requiring offsite waste management. Other interrelationships are outlined in **Paragraph 20.2.4b** and **20.2.4e.**

20.2 Scoping Opinion

20.2.1 A scoping exercise was undertaken in August 2022 to establish the form and nature of the waste and materials assessment, and the approach and methods to be followed.

20.2.2 The Scoping Report (**Appendix 1.A** of PEI Report, Volume IV) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on materials and waste.

20.2.3 As outlined in the Scoping Report and confirmed in the Scoping Opinion (**Appendix 1.B** of PEI Report, Volume IV) and **Table 20.1** (Summary of Consultation to Date) regarding the information to be provided in the Environmental Statement (ES), the following requirements have been identified which will be taken into account as part of the ongoing materials and waste assessment:

a. The ES must provide an estimate of the types of quantities of waste that would arise from decommissioning.

Table 20.1: Scoping Opinion comments on material assets and waste

Consultee	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	The Scoping Report assumes that waste arising from the extraction, processing and manufacture of construction components and products that would be used during the Project are being produced in manufacturing facilities with their own waste management plans, facilities, and supply chain (outside of the geographical scope of the assessment) and therefore seeks to scope this matter out of the assessment. The Inspectorate is content to scope this matter out on this basis.	The comment is noted.
	The Scoping Report states that other impacts associated with the management of waste (e.g. on water resources, air quality, noise or traffic resulting from the generation, handling, on-site temporary storage or off-site transport of materials and waste) are addressed separately in other relevant chapters of the ES and can therefore be scoped out of this aspect chapter. The Inspectorate agrees that this impact pathway should be considered separately in the other relevant chapters of the ES. The Materials and Waste aspect chapter should however cross reference to where this has been assessed elsewhere.	The comment is noted. The Materials and Waste chapter of the ES will include cross references to other aspect chapters where appropriate.
	The Scoping Report seeks to scope out this matter as the project site is not in the vicinity of any safeguarded/ allocated mineral sites. The Inspectorate agrees that this matter can be scoped out due to the absence of this type of receptor in the development study area.	The comment is noted.
	The Scoping Report seeks to scope out this matter as the project site is not in the vicinity of any Mineral Safeguarding Areas. The Inspectorate agrees that this matter can be scoped out due to the absence of this type of receptor in the development study area.	The comment is noted. Impacts are not assessed in the materials and waste assessment in accordance with the IEMA Guidance. However, MSAs are included for context in the baseline since MSAs are a planning consideration. It is noted that the Project does not pass through any MSAs.

Consultee	Summary of Response	How comments have been addressed in this chapter
	The Scoping Report states that dredged materials would not be brought onshore for disposal and the effects associated would be addressed separately in other relevant chapters within the ES (Chapter 8 Nature Conservation (Marine), Chapter 9 Ornithology, Chapter 11 Marine Transport and Navigation, Chapter 14 Historic Environment (Marine), Chapter 15 Physical Processes, Chapter 16 Marine Water and Sediment Quality). On the basis that dredging arisals will not be disposed onshore, the Inspectorate considers that this matter is adequately addressed in the other aspect chapters and can therefore be scoped out of the materials and waste chapter.	The comment is noted. Any material not suitable for management within the estuary would be brought onshore (e.g. contaminated material). Material requiring management onshore will be considered in the materials and waste ES chapter. Material quantities are not yet confirmed.
	The Scoping Report considers that any forecast effects (using professional judgement) on the availability of materials during operation would be negligible in relation to the scale and nature of the development. The Inspectorate agrees given the nature of the development operational materials use can be scoped out of the assessment.	The comment is noted.
	The Scoping Report argues that it is not possible to assess waste and material resources effects of decommissioning, since waste infrastructure, technologies and good practices are likely to be substantially different to those currently in place. It states that an outline of the approach to decommissioning will be provided within the ES, which will detail measures envisaged to be implemented to avoid or reduce impacts during the decommissioning of the landside elements. Given the nature and scale of the development the Inspectorate agrees that this matter can be scoped out of the ES, however the ES must provide an estimate of the types of quantities of waste that would arise from decommissioning.	The landside elements of the Project have a design life of up to approximately 25 years although the operational life could be longer, and when appropriate, this infrastructure would be decommissioned and all materials removed would be reused or recycled where possible or disposed of in accordance with relevant waste disposal regulations at the time of decommissioning. The DCO application would not make any provision for the decommissioning of the marine infrastructure or plant or equipment on the jetty topside and this is discussed further in **Chapter 2: The Project**. It is not possible to assess waste and material resources effects of decommissioning of landside elements at the present time, since waste infrastructure, technologies and good practices are likely to be substantially different to those currently in place: specific measures would be addressed as part of a Decommissioning Environmental Management Plan produced prior

Consultee	Summary of Response	How comments have been addressed in this chapter
		to the decommissioning phase. The facility design is to, as far as possible use a flexible modular construction and this approach makes decommissioning easier, quicker and means it has lower environmental impact by preventing waste generation. The process plant is constructed mainly from metals that are easy to reuse or recycle., individual items of equipment may be removed and redeployed. There is no underground storage. An Outline Decommissioning Environmental Management Plan (DEMP) including an estimate of the types and quantities of waste that would arise from decommissioning of the landside elements will be submitted with the DCO. Application and a detailed DEMP will be secured via a requirement of the DCO. In a worst-case scenario, where the Project elements would be fully removed, the potential risks during the decommissioning phase would be similar to those encountered during the Project construction phase.
Environment Agency	We are pleased to see the acknowledgement in paragraph 19.6.2 that any waste producers have a legal duty to manage their wastes in accordance with regulations: wastes produced or imported must be moved with due regard to the legal requirements for registered Waste Carriers under The Waste (England and Wales) Regulations 2011. If wastes are used for any construction they must be stored at an appropriately permitted or exempt site, in accordance with the Environmental Permitting (England & Wales) Regulations 2016. Any direct transfer and reuse of clean naturally occurring soil materials between sites must be done in accordance with the Definition of Waste: Development Industry Code of Practice. Site drainage must be engineered to prevent pollution to the environment. Any potentially contaminated or contaminating liquids must be held and disposed of appropriately.	The reuse of excavated material would be covered by a Contaminated Land: Applications in Real Environments (CL:AIRE) Definition of Waste: Development Industry Code of Practice (DoW CoP) Materials Management Plan (MMP) developed by the Contractor before the commencement of construction. Details of the requirements for the contractor will be set out in an Outline Environmental Management Plan (OEMP). An OEMP will accompany the DCO application.

20.2.4 Having regard to the information presented within the Scoping Report (**Appendix 1.A** of PEI Report, Volume IV), the Planning Inspectorate's Scoping Opinion (**Appendix 1.B** of PEI Report, Volume IV) has confirmed the Applicant's view that some materials and waste aspects are unlikely to generate significant effects and can thus be scoped out of consideration in the ES as follows:

a. Waste arising from extraction, processing and manufacture of construction components and products.

b. Other environmental impacts associated with the management of waste from the Project (e.g. on water resources, air quality, noise or traffic resulting from the generation, handling, on-site temporary storage or off-site transport of materials and waste).

c. Direct impacts on safeguarded/ allocated mineral sites.

d. Direct impacts on Mineral Safeguarding Areas (MSAs).

e. Materials arising from marine dredging (unless material is not suitable for management in the estuary e.g. contaminated material). .

f. Effects on the availability of materials during operation.

g. Effects associated with decommissioning of the Project.

20.3 Legislation, Policy and Guidance

20.3.1 **Table 20.2** presents the legislation, policy and guidance relevant to the materials and waste assessment and details how their requirements will be met by the Project.

Table 20.2: Relevant legislation, policy and guidance regarding materials and waste

Legislation/ Policy/ Guidance	Consideration within the PEI Report
Waste Framework Directive (2008) (Ref 20-2)	
Establishes the wider regulatory context for waste management across Europe. In addition to defining waste, it also introduces the concept of the waste hierarchy and establishes landfill diversion targets for Member States. The requirements of the Waste FD are transposed into applicable national law through the *Waste (England and Wales) Regulations 2011* (Ref 20-3) as amended including The Waste (Miscellaneous Amendments) (EU Exit) Regulations 2019 (Ref 20-4).	The assessment of materials and waste has taken account of the waste hierarchy in the management of waste, and of the targets for recovery of non-hazardous construction and demolition (C&D) waste.
The Environmental Protection Act 1990 (Ref 20-5)	
The duty of care for waste management is set out under section 34 of the *Environmental Protection Act 1990* and the *Waste (England and Wales) Regulations 2011 (as amended)*. It requires anyone who produces, imports, keeps, stores, transports, treats or disposes of waste to take all reasonable steps to ensure that waste is managed properly.	Details of the duty of care for waste management requirements for the contractor will be set out in the Outline Site Waste Management Plan (OSWMP) which will accompany the Development Consent Order (DCO) application and the contractor's Site

Legislation/ Policy/ Guidance	Consideration within the PEI Report
	Waste Management Plan (SWMP) to be prepared before the commencement of construction (as based upon the OSWMP).
The Waste (England and Wales) Regulations 2011 (Ref 20-3)	
Transposes the requirements of the Waste FD in England and Wales and requires the Secretary of State (SoS) to establish waste prevention programmes and waste management plans that apply the waste hierarchy (as defined in the Waste FD). The waste hierarchy prioritises waste prevention, followed by preparing for reuse, recycling, recovery and finally disposal to the management of waste. The Regulations require businesses to apply the waste hierarchy when managing waste, and also require that measures are taken to ensure that, by the year 2020, at least 70% by weight of non-hazardous C&D waste is subjected to material recovery.	The assessment of materials and waste has taken account of the waste hierarchy in the management of waste, and of the targets for recovery of non-hazardous C&D waste.
The Environmental Permitting (England and Wales) Regulations 2016 (Ref 20-6)	
The Regulations require sites where waste is processed, treated or disposed of to hold a valid Environmental Permit issued by the Environment Agency (EA). The Regulations also include a schedule of activities that are exempt from the requirements of permitting. However, to comply with the Regulations, an exempt activity must generally be registered with the EA before commencing.	Details of the permits and exemption requirements for the contractor will be set out in the OSWMP which will accompany the DCO application and the contractor's SWMP to be prepared before the commencement of construction (as based upon the OSWMP).
The Hazardous Waste (England and Wales) Regulations 2005 (Ref 20-7)	
The Regulations set out the regime for the control and tracking of the movement of hazardous waste for the purpose of transposing the requirements of the *Hazardous Waste Directive (Directive 91/689/EC)* (Ref 20-8).	Details of the hazardous waste management requirements for the contractor will be set out in the OSWMP which will accompanying the DCO application and the contractor's SWMP to be prepared before the commencement of construction (as based upon the OSWMP).
The Environment Act 2021 (Ref 20-9)	
The Act makes provision about targets, plans and policies for improving the natural environment; for statements and reports about environmental protection; for the establishment of the Office for Environmental Protection; about waste and resource efficiency; about air quality; for the recall of products that fail to meet environmental standards; about water; about nature and biodiversity; for conservation covenants; about the regulation of chemicals; and for connected purposes. The Act will deliver:	Key sections including Part 3 Waste and Resource Efficiency (producer responsibility, resource efficiency, managing waste and waste enforcement) which could be relevant to the Project in the *Environment Act 2021* have been considered in the assessment.

Legislation/ Policy/ Guidance	Consideration within the PEI Report
• An extension of producer responsibility to make producers pay for 100% of the cost of disposal of products, starting with plastic packaging. • A Deposit Return Scheme for single use drinks containers. • Charges for single use plastics. • Greater consistency in recycling collections in England. • Electronic waste tracking to monitor waste movements and tackle fly-tipping. • Further tackling of waste crime. • The power to introduce new resource efficiency information (labelling on the recyclability and durability of products). • The regulation of the shipment of hazardous waste. • A ban or export restriction of waste to non-OECD countries.	
National Policy Statement for Ports (NPSfP) (Ref 20-11)	
Paragraph 5.5.2 of Section 5.5: Waste Management states *"Sustainable waste management is implemented through the 'waste hierarchy':* • *prevention;* • *preparing for re-use;* • *recycling;* • *other recovery, including energy recovery; and* • *disposal.* *Disposal of waste should only be considered where other waste management options are not available or where it is the best overall environmental outcome."*	The assessment of materials and waste has taken account of the waste hierarchy in the management of waste.
Paragraph 5.5.3 states *"All large infrastructure projects are likely to generate hazardous and non hazardous waste during the construction, operation and decommissioning phases. The Environment Agency's (EA) Environmental Permitting (EP) regime incorporates operational waste management requirements for certain activities. When an applicant applies to the EA for an Environmental Permit, the EA will require the application to demonstrate that processes are in place to meet all relevant EP requirements."*	Details of the permits and exemption requirements for the contractor will be set out in the OSWMP which will accompany the DCO application and the contractor's SWMP to be prepared before the commencement of construction (as based upon the OSWMP).
Paragraph 5.5.4 states *"The applicant should set out the arrangements that are proposed for managing any waste produced and prepare a Site Waste Management Plan. The arrangements described and the Management Plan should include information on the proposed waste recovery and disposal system for all waste generated by the development*	A OSWMP will accompany the DCO application, whilst the contractor will develop a SWMP before the commencement of construction (as based upon the OSWMP).

Legislation/ Policy/ Guidance	Consideration within the PEI Report
and an assessment of the impact of the waste arising from development on the capacity of waste management facilities to deal with other waste arising in the area for at least five years of operation. The applicant should seek to minimise the volume of waste produced and the volume of waste sent for disposal, unless it can be demonstrated that this is the best overall environmental outcome."	The assessment considers the impact of the waste arising from the Project on the capacity of waste management facilities, specifically landfills. Operational waste quantities are not yet known and will be further assessed in the ES. The approach to minimising waste for the Project is outlined in **Section 20.6** of this chapter.
Paragraph 5.5.5 states *"The decision-maker should consider the extent to which the applicant has proposed an effective system for managing hazardous and non-hazardous waste arising from the construction, operation and decommissioning of the proposed development. It should be satisfied that:* • *any such waste will be properly managed, both on-site and off-site;* • *the waste from the proposed facility can be dealt with appropriately by the waste infrastructure which is, or is likely to be, available. Such waste arisings should not have an adverse effect on the capacity of existing waste management facilities to deal with other waste arisings in the area; and* • *adequate steps have been taken to minimise the volume of waste arisings, and of the volume of waste arisings sent to disposal, except where that is the best overall environmental outcome."*	An OSWMP will accompany the DCO application, whilst the contractor will develop a SWMP before the commencement of construction (as based upon the OSWMP). The assessment considers the impact of the waste arising from the Project on the capacity of waste management facilities, specifically landfill. Operational waste quantities are not yet known and will be further assessed in the ES. The approach to minimising waste for the Project is outlined in **Section 20.6** of this chapter.
National Planning Policy Framework (NPPF) (Ref 20-12)	
The NPPF does not contain specific waste policies as these are detailed within the National Planning Policy for Waste (Ref 20-13) and Waste Management Plan for England (Ref 20-14), however, the following overarching policies are relevant to materials and waste: • The environmental objective set out at paragraph 8 of the NPPF is *"to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."* • The environmental objective set out in paragraph 210 of the NPPF is to *"so far as practicable, take account of the contribution that substitute or secondary and recycled materials and minerals waste would make to the supply of materials, before considering extraction of primary*	The approach to minimising waste for the Project is outlined in **Section 20.6** of this chapter. A recycled content target would be considered for inclusion in the contractor's SWMP.

Legislation/ Policy/ Guidance	Consideration within the PEI Report
materials, whilst aiming to source minerals supplies indigenously."	
National Planning Policy Guidance (NPPG) for Minerals (Ref 20-15) **and Waste** (Ref 20-16)	
Published to provide more in-depth guidance to the NPPF. The NPPG aims to make planning guidance more accessible and ensures that the guidance is kept up to date.	The guidance provides further information in support of the implementation of waste planning policy and on the planning for mineral extraction in plan making and the application process. This information has been taken into consideration when reviewing local policy, but is not directly used in the assessment.
National Planning Policy for Waste (Ref 20-13)	
The National Planning Policy for Waste sets out detailed waste planning policies to be applied in conjunction with the NPPF. It states: "*when determining planning applications for non-waste development, local planning authorities should, to the extent appropriate to their responsibilities, ensure that:* • *The likely impact of proposed, non-waste related development on existing waste management facilities, and on sites and areas allocated for waste management, is acceptable and does not prejudice the implementation of the waste hierarchy and/or the efficient operation of such facilities;* • *New, non-waste development makes sufficient provision for waste management and promotes good design to secure the integration of waste management facilities with the rest of the development, and* • *The handling of waste arising from the construction and operation of development maximises reuse/recovery opportunities, and minimises off-site disposal*".	The likely impact of proposed, non-waste related development (the Project) on existing waste management facilities (specifically landfill) is considered in the assessment. Embedded mitigation measures include activities that would be undertaken during the design stage to minimise waste thus reducing the need for waste management and landfill disposal. These include the design of adequate provision for internal and external waste storage to allow waste segregation during Project operation. The assessment of materials and waste has taken account of the waste hierarchy in the management of waste, and of the targets for recovery of non-hazardous construction and demolition waste. An OSWMP will accompany the DCO application, whilst the contractor will develop a SWMP before the commencement of construction (as based upon the OSWMP).
The Waste Management Plan for England 2021 (Ref 20-14)	
Provides an overview of waste management in England and reiterates the requirement for all waste producers and waste management providers to implement the waste hierarchy. It also highlights the need for waste to be managed using the	The assessment of materials and waste has taken account of the waste hierarchy in the management of

Legislation/ Policy/ Guidance	Consideration within the PEI Report
proximity principle and confirms England's commitment to recovering at least 70% by weight of non-hazardous C&D waste by 2020 (excluding soils and stones). Recovery is assumed in the context of this policy to include reuse, recycling and incineration with energy recovery.	waste, and of the targets for recovery of non-hazardous C&D waste.
A Green Future: Our 25 Year Plan to Improve the Environment (Ref 20-17)	
The plan "*sets out goals for improving the environment within a generation and leaving it in a better state than we found it*". It details how the government will work with communities and businesses to do this. The following policies are relevant: • Make sure that resources are used more efficiently and kept in use for longer to minimise waste and reduce its environmental impacts by promoting reuse, remanufacturing and recycling. • Work towards eliminating all avoidable waste by 2050 and all avoidable plastic waste by end of 2042. • Reducing food supply chain emissions and waste. • Reducing litter and littering. • Improving management of residual waste.	Key policies which could be relevant to the Project such as waste minimisation have been considered in Section 20.6. The approach to minimising waste for the Project is outlined in **Section 20.6** of this chapter.
Our Waste, Our Resources, A Strategy for England (Ref 20-18)	
The Strategy will help the government to meet the commitments outlined in the 25 Year Plan and "*sets out how we will preserve our stock of material resources by minimising waste, promoting resource efficiency and moving towards a circular economy. At the same time we will minimise the damage caused to our natural environment by reducing and managing waste safely and carefully, and by tackling waste crime*." The strategy combines actions to be taken now and commitments for the coming years. Key targets and milestones and targets, which could be relevant to the Project, include: • Roll out of a deposit return scheme (subject to consultation) – 2023. • Legislation for mandatory separate food waste collections (subject to consultation) – 2023; • 75% recycling rate for packaging (subject to consultation) – 2023; • 65% recycling rate for municipal solid waste – 2035. • Municipal waste to landfill 10% or less – 2035.	Key targets and milestones which could be relevant to the Project such as how waste might need to be managed onsite (e.g. segregation) are considered in **Section 20.6**.

Legislation/ Policy/ Guidance	Consideration within the PEI Report
North East Lincolnshire Local Plan 2013 to 2032 (Ref 20-19)	
Sets out the Council's approach to accommodating future requirements in relation to the demands on the Borough's mineral resource and waste needs. Relevant policies include: • Policy 44 – Safeguarding minerals and related infrastructure. • Policy 45 – Future mineral extraction and Secondary Aggregates. • Policy 47 – Future requirements for waste facilities. • Policy 48 – Safeguarding waste facilities and related infrastructure. • Policy 49 – Restoration and aftercare (waste). The Policy Map (Ref 20-20) shows the extent of Mineral Safeguarding Areas (MSAs) for sand and gravel and blown sand and existing waste management facilities.	**Section 20.5** of this chapter considers allocated/ safeguarded mineral and waste sites in the vicinity of the Project.
IEMA Guidance (Ref 20-1)	
The document offers guidance and recommendations for EIA practitioners and stakeholders concerned with the impacts and effects of materials and waste on the environment. The guidance provides considerations for screening, scoping, consultation, assessment and subsequent reporting and monitoring.	The assessment has been completed in accordance with the IEMA Guidance as outlined in **Section 20.4**.
Contaminated Land: Applications in Real Environments (CL:AIRE) Definition of Waste: Development Industry Code of Practice (DoW CoP), v2 (Ref 20-21)	
The DoW CoP provides a process which enables the reuse of excavated materials on-site or their movement between sites. Use of the DoW CoP supports the sustainable and cost-effective development of land. It can provide an alternative to Environmental Permits or Waste Exemptions.	The reuse of excavated material would be covered by a CL:AIRE DoW CoP Materials Management Plan (MMP) developed by the Contractor before the commencement of construction. Details of the requirements for the Contractor will be set out in an Outline Environmental Management Plan (OEMP). An OEMP will accompany the DCO application
Waste and Resources Action Programme (WRAP) Designing Out Waste: A Design Team Guide for Civil Engineering (Ref 20-22) **and Designing Out Waste: A Design Team Guide for Buildings** (Ref 20-23).	
The guides outline the case for taking action to designing out waste, provides a detailed explanation of the key principles that	Designing out waste key principles have been considered and will

Legislation/ Policy/ Guidance	Consideration within the PEI Report
designers can use during the design process and how these principles can be applied to civil engineering and building projects to maximise opportunities to reduce construction waste and use materials more efficiently. It gives examples of technical solutions and how, in practice, designers have helped achieve significant waste reductions.	continue to be considered during the design of the Project and are outlined in **Section 20.4** of this chapter.

20.4 Assessment Method

20.4.1 The general approach for Environmental Impact Assessment (EIA) provided in **Chapter 5: EIA Approach** is not used for materials and waste since specific topic guidance for materials and waste has been developed by IEMA (Ref 20-1).

20.4.2 As per the IEMA Guidance embedded measures are considered prior to the assessment of effects to avoid considering assessment scenarios that are unrealistic in practice i.e. do not take account of such measures even though they are likely to be standard practice standard mitigation and/ or form part of the Project design (embedded mitigation). Taking these measures into account means that realistic likely environmental effects are identified. Where likely significant adverse effects are identified after considering these embedded measures, Project specific mitigation measures will be considered, developed and proposed, where necessary and possible.

Scope of the Assessment

20.4.3 The assessment of materials and waste considers the following:

a. Waste producers have a legal duty of care to manage their waste in accordance with regulations and to ensure that any waste leaving the site where it is generated is transferred to a suitably licensed facility for further treatment or disposal.

b. Facilities transferring, treating or disposing of waste must be either licensed or apply for an exemption from a licence, and impacts arising from the operation of waste management facilities are considered as part of the planning and permitting process for these facilities themselves.

c. As part of their planning function, Waste Planning Authorities (WPAs) are required to ensure that sufficient land is available to accommodate facilities for the treatment of all waste arising in the area, either within the WPA area, or through export to suitable facilities in other areas.

d. MPAs are required to ensure an adequate supply of minerals, sufficient to meet the needs of national and regional supply policies, and local development needs.

20.4.4 The sensitive receptors for the materials and waste assessment are:

a. Landfill void capacity in the expansive study areas of East Midlands and Yorkshire and the Humber (non-hazardous landfill void capacity) and England (hazardous landfill void capacity). As defined in the IEMA Guidance "*landfill is a finite resource, and hence – through the ongoing disposal of*

waste – there is a continued need to expand existing and develop new facilities, this requires the depletion of natural and other resources which, in turn, adversely impacts the environment."

b. Materials, national and regional consumption of key construction materials. As outlined in the IEMA Guidance "*materials are, in their own right, sensitive receptors. Consuming materials impacts upon their immediate and (in the case of primary material) long-term availability; this results in the depletion of natural resources and adversely impacts the environment*."

c. Safeguarded/ allocated waste sites.

20.4.5 The IEMA Guidance "*does not consider waste processing and recovery facilities as sensitive receptors, rather: they are part of a system that has the potential to reduce the magnitude of adverse impacts associated with waste generation and disposal. Waste processing and recovery facilities are, hence, different to landfills, in that the latter are finite resources*."

20.4.6 The materials and waste assessment entails the following:

Materials

a. Establishing the baseline for national and regional consumption of key materials (construction materials) by weight.

b. Assessing the sensitivity of materials as related to the availability and types of materials to be consumed by the Project during construction.

c. Establishing the quantities of key construction materials required for the construction of the Project.

d. Comparing the total quantities of key construction materials with the most recent national and regional demand (using a percentage approach).

e. Considering whether any allocated/ safeguarded waste sites would be impacted by the Project.

Waste

a. Establishing the baseline landfill void capacity in the defined study areas.

b. Assessing the sensitivity of landfill void capacity.

c. Establishing the quantities of construction, demolition and excavation waste to be generated during the construction of the Project.

d. Comparing the total waste arising from the construction of the Project against the landfill void capacity (using a percentage approach).

Assessment Criteria

Sensitivity

20.4.7 The sensitivity of materials takes into account the availability and type of construction material to be consumed by the Project. The IEMA Guidance criteria described within **Table 20.3** have been used to determine the sensitivity of materials.

Table 20.3: Materials Receptors Sensitivity

Effects	Criteria for Materials Receptor Sensitivity
Negligible	On balance, the key materials required for the construction of the Project are forecast (through trend analysis and other information) to be free from known issues regarding supply and stock. *And/or* Are available, comprising a very high proportion of sustainable features and benefits compared to industry-standard materials.*
Low	On balance, the key materials required for the construction of the Project are forecast (through trend analysis and other information) to be generally free from known issues regarding supply and stock. *And/or* Are available, comprising a high proportion of sustainable features and benefits compared to industry-standard materials.
Medium	On balance, the key materials required for the construction of the Project are forecast (through trend analysis and other information) to suffer from some potential issues regarding supply and stock. *And/or* Are available, comprising some sustainable features and benefits compared to industry-standard materials.
High	On balance, the key materials required for the construction of the Project are forecast (through trend analysis and other information) to suffer from known issues regarding supply and stock. *And/or* Comprise little or no sustainable features and benefits compared to industry-standard materials.
Very High	On balance, the key materials required for the construction of the Project are forecast are known to be insufficient in terms of production, supply and/ or stock. *And/ or* Comprise no sustainable features and benefits compared to industry-standard materials.
* Subject to supporting evidence, sustainable features and benefits could include, for example, materials or products that: comprise reused, secondary or recycled content (including excavated and other arisings); support the drive to a circular economy; or in some other way reduce lifetime environmental impacts.	

20.4.8 The sensitivity of waste relates to the availability of landfill capacity in the absence of the Project. As outlined in the IEMA Guidance "*landfill capacity is recognised as an unsustainable and increasingly scarce option for managing waste*". The sensitivity of landfill capacity has been assessed based on a review of historic landfill void capacity trends where available and information from relevant policy documents.

20.4.9 The criteria described within **Table 20.4** and **Table 20.5** have been used to determine the sensitivity of landfill capacity.

Table 20.4: Inert and Non-hazardous Landfill Capacity Sensitivity

Effects	Criteria for Inert and Non-hazardous Landfill Capacity Sensitivity
Negligible	Across construction and/ or operational phases, the baseline/ future baseline (i.e. without the Project) of regional inert and non-hazardous landfill capacity expected to remain unchanged, or is expected to increase through a committed change in capacity.
Low	Across construction and/ or operational phases, the baseline/ future baseline (i.e. without the Project) of regional inert and non-hazardous landfill capacity is expected to reduce minimally by <1% as a result of wastes forecast.
Medium	Across construction and/ or operational phases, the baseline/ future baseline (i.e. without the Project) of regional inert and non-hazardous landfill capacity is: expected to reduce noticeably by 1-5% as a result of wastes forecast.
High	Across construction and/ or operational phases, the baseline/ future baseline (i.e. without the Project) of regional inert and non-hazardous landfill capacity is: expected to reduce considerably: by 6-10% as a result of wastes forecast.
Very High	Across construction and/ or operational phases, the baseline/ future baseline (i.e. without the Project) of regional inert and non-hazardous landfill capacity is: • Expected to reduce very considerably (by >10%). • End during construction or operation. • Is already known to be unavailable. • Would require new capacity or infrastructure to be put in place to meet forecast demand.

Table 20.5: Hazardous Landfill Capacity Sensitivity

Effects	Criteria for Hazardous Landfill Capacity Sensitivity
Negligible	Across the construction and/ or operational phases, the baseline/future baseline (i.e. without the Project) of regional (or where justified, national) hazardous landfill capacity is expected to remain unchanged, or is expected to increase through a committed change in capacity.
Low	Across the construction and/ or operational phases, the baseline/future baseline (i.e. without the Project) of regional (or where justified, national) hazardous landfill capacity is expected to reduce minimally: by <0.1% as a result of wastes forecast.
Medium	Across the construction and/ or operational phases, the baseline/future baseline (i.e. without the Project) of regional (or where justified, national) hazardous landfill capacity is: expected to reduce noticeably: by 0.1-0.5% as a result of wastes forecast.

Effects	Criteria for Hazardous Landfill Capacity Sensitivity
High	Across the construction and/ or operational phases, the baseline/future baseline (i.e. without the Project) of regional (or where justified, national) hazardous landfill capacity is expected to reduce considerably: by 0.5-1% as a result of wastes forecast.
Very High	Across the construction and/ or operational phases, the baseline/ future baseline (i.e. without the Project) of regional (or where justified, national) hazardous landfill capacity is: • Expected to reduce very considerably (by >1%); • End during construction or operation; • Is already known to be unavailable; or • Would require new capacity or infrastructure to be put in place to meet forecast demand.

Magnitude

20.4.10 The magnitude of impact describes the degree of variation from the baseline conditions as result of the Project. The methodology for assessing the magnitude of impact associated with materials comprises a percentage-based approach that determines the influence of construction materials use during the construction of the Project on the baseline national and regional demand. The criteria used to assess the magnitude of impact for materials are provided within **Table 20.6**.

Table 20.6: Materials Magnitude of Impacts

Effects	Criteria for Materials Magnitude of Impacts
No change	Consumption of no materials is required.
Negligible	Consumption of no individual material type is equal to or greater than 1% by volume of the regional* baseline availability.
Minor	Consumption of one or more materials is between 1-5% by volume of the regional* baseline availability.
Moderate	Consumption of one or more materials is between 6-10% by volume of the regional* baseline availability.
Major	Consumption of one or more materials is >10% by volume of the regional* baseline availability.
**A national baseline is used for steel in the absence of regional consumption data.*	

20.4.11 The methodology for assessing the magnitude of impact for waste comprises a percentage-based approach that determines the influence of waste generation from the construction of the Project on the baseline landfill capacity. The criteria used to assess the magnitude of impact for waste are provided within **Table 20.7** and **Table 20.8** for inert and non-hazardous waste and hazardous waste respectively.

Table 20.7: Inert and Non-Hazardous Waste - Magnitude of Impact

Effects	Criteria for Waste Magnitude of Impacts
No change	Zero waste generation and disposal from the Project.
Negligible	Waste generated by the Project would reduce expansive study area landfill capacity baseline# by <1%.
Minor	Waste generated by the Project would reduce expansive study area landfill capacity baseline# by 1-5%.
Moderate	Waste generated by the Project would reduce expansive study area landfill capacity baseline# by 6-10%.
Major	Waste generated by the Project would reduce expansive study area landfill capacity baseline# by >10%.
# Forecast as the worst-case scenario, during a defined construction and/ or operational phase.	

Table 20.8: Hazardous Waste - Magnitude of Impact

Effects	Criteria for Waste Magnitude of Impacts
No change	Zero waste generation and disposal from the Project.
Negligible	Waste generated by the Project would reduce expansive study area landfill capacity baseline# by <0.1%.
Minor	Waste generated by the Project would reduce expansive study area landfill capacity baseline# by <0.1-0.5%.
Moderate	Waste generated by the Project would reduce expansive study area landfill capacity baseline# by <0.5-1%.
Major	Waste generated by the Project would reduce expansive study area landfill capacity baseline# by >1%.
# Forecast as the worst-case scenario, during a defined construction and/ or operational phase.	

Significance

20.4.12 **Table 20.9** describes the effect thresholds used to determine the significance of potential materials and waste effects (taking into account receptor sensitivity and the magnitude of impact), whilst **Table 20.10** shows that effects assessed as being moderate, large or very large are deemed to be significant.

Table 20.9: Effect Thresholds

		Magnitude of Impact				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
Sensitivity of Receptor	**Very High**	Neutral	Slight	Moderate or large	Large or very large	Very large
	High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
	Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

Table 20.10: Significance of Effect

Effect	**Materials**	**Waste**
Neutral	Not significant	Not significant
Slight		
Moderate	Significant	Significant
Large		
Very large		

Stakeholder Engagement

20.4.13 A range of stakeholders have been engaged as part of the scoping process to obtain their views on the Project and the scope of the materials and waste assessment. Comments from stakeholders are detailed within the Scoping Opinion (**Appendix 1.B** in PEI Report Volume IV).

20.4.14 The Environment Agency noted the following:

a. Waste producers have a legal duty to manage their wastes in accordance with regulations

b. Wastes produced or imported must be moved with due regard to the legal requirements for registered Waste Carriers under The Waste (England and Wales) Regulations 2011.

c. If wastes are used for any construction they must be stored at an appropriately permitted or exempt site, in accordance with the Environmental Permitting (England & Wales) Regulations 2016.

d. Any direct transfer and reuse of clean naturally occurring soil materials between sites must be done in accordance with the CL:AIRE DoW CoP.

e. Site drainage must be engineered to prevent pollution to the environment.

f. Any potentially contaminated or contaminating liquids must be held and disposed of appropriately.

20.4.15 No materials and waste specific consultation has been undertaken to date. Further consultation will be undertaken as required. Consultation in relation to the safeguarding of allocated/ safeguarded waste sites in the vicinity of the Project would be required as described in **Table 20.14**. However, permanent impacts upon allocated/ safeguarded waste sites are not anticipated: any Project impacts on site access would be of limited duration (during construction only), whilst alternative access arrangements would be put in place during this time in order to avoid undue disruption.

Limitations and Assumptions

20.4.16 The information presented in this preliminary assessment reflects that obtained and evaluated at the time of reporting, and is based on an emerging design for the Project and the maximum likely extents of land required for its construction and operation in accordance with the principles of the Rochdale Envelope approach.

20.4.17 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further through the assessment and consultation processes, and as further research and investigative surveys are completed to fully understand its potential effects.

Study Area

20.4.18 The study areas for the assessment of impacts related to materials and waste have been defined in line with the IEMA Guidance. Two types of study area are defined in the IEMA Guidance, namely a 'Project Study Area' relevant to waste generation, material use and impacts on allocated/ safeguarded sites; and an 'Expansive Study Area' relevant to management of waste and the availability of materials. Within this section, study areas are defined for the following:

a. Construction and operational waste generation.

b. Use of construction materials (key construction materials only (steel, aggregates, asphalt and concrete).

c. Impact on allocated/ safeguarded mineral and waste sites.

d. Presence of MSAs.

e. Non-hazardous, inert and hazardous construction waste management.

f. Non-hazardous, inert and hazardous operational waste management.

g. Availability of key construction materials.

Project Study Area

20.4.19 The Project study area for construction and operational waste generation and the use of construction and materials (key construction materials only) comprises the

Project site. The study area is deemed to include the footprint of the proposed works, together with any temporary land requirements during construction which may include temporary offices, compounds and storage areas.

20.4.20 The Project study area for the impacts on allocated/ safeguard mineral and waste sites is defined by the Project site boundary. Impacts on allocated/ safeguarded waste sites are not included in the IEMA Guidance, however are included for completeness.

20.4.21 Impacts on MSAs are not assessed in the materials and waste assessment in accordance with the IEMA Guidance. However, MSAs are included for context in the baseline since MSAs are a planning consideration.

Expansive Study Area

20.4.22 The expansive study area for non-hazardous waste management (construction and operation) comprises the East Midlands and Yorkshire and the Humber. The expansive study area includes the following sub-regions as outlined in the *EA's 2021 Waste Summary Tables for England* - Version 2 (Ref 20-24):

a. Lincolnshire, Derbyshire, Leicestershire, Northamptonshire and Nottinghamshire.

b. Former Humberside, North Yorkshire, South Yorkshire, West Yorkshire.

20.4.23 The expansive study area for non-hazardous and inert waste management is defined based on professional judgement and informed by consideration of the proximity principle and value for money. The study area has been determined to comprise the wider region within which landfill capacity is located i.e. East Midlands region and the Yorkshire and the Humber region since the Project is located close to the northern border of the East Midlands and waste could be managed in either region.

20.4.24 The expansive study area for hazardous waste management (construction and operation) is England. The expansive study area is defined based on professional judgement and informed by consideration of the proximity principle and value for money. The proximity principle for hazardous waste in England is outlined in Principle 2 - Infrastructure Provision in the Strategy for Hazardous Waste Management in England "*We look to the market for the development of hazardous waste infrastructure, which implements the hierarchy for the management of hazardous waste and meets the needs of the UK to ensure that the country as a whole is self-sufficient in hazardous waste disposal, facilities are put in place for hazardous waste recovery in England, and the proximity principle is met*" (Ref 20-25). Planning for hazardous waste management is also undertaken at a national level.

20.4.25 The expansive study area for availability of key construction materials (aggregates, asphalt, concrete and steel) covers the United Kingdom (UK) or Great Britain (GB) or East Midlands region and the Yorkshire and the Humber region dependent on baseline information availability. Regional information on the availability of key construction materials is included in the baseline where available.

20.5 Baseline Conditions

Regional and National Availability of Key Construction Materials

Current Baseline

20.5.1 UK and GB data and regional data has been used to establish a quantitative national baseline of the consumption for key constructional materials. Table 20.11 summarises national consumption in 2018 for aggregates, asphalt, concrete and steel (the most recent year for which data is available), which are the key construction materials expected to be used during the construction of the Project.

Table 20.11: National Consumption for Key Construction Materials

Material	National Consumption (million tonnes, year)	Baseline Data Year	Data Description
Steel	17	2018	UK total consumption (Ref 20-26)
Aggregates **of which:**	251	2018	Minerals and mineral products sales in Great Britain (Ref 20-27)
• Crushed rock	117.3		
• Sand and gravel - land won	48.9		
• Sand and gravel - marine	13.7		
• Recycled and secondary	71		
Asphalt	25.4		
Concrete **of which:**	86.2		
• Ready-Mixed Concrete	54.2		
• Concrete products	32		

20.5.2 Construction material sales data by region are provided for the regions surrounding the Project in **Table 20.12**. It is assumed that the majority of key construction materials (e.g. aggregates, asphalt and concrete) required for the Project would be sourced regionally, taking into account the proximity principle and value for money. Other materials such as steel may be sourced at a national level.

Table 20.12: Construction Material Sales by Region

Construction Material	East Midlands	Yorkshire and the Humber
Crushed rock (million tonnes)	26.5	11.5
Sand and gravel (million tonnes)	6.1	2.3
Ready-mixed concrete (million m^3)	1.4	1.2
Asphalt (million tonnes)	2.8	2.1

20.5.3 Potential recycled contents for the main construction materials likely to be used during Project construction are outlined in **Table 20.13**. These "good practice" rates are derived from WRAP's Designing Out Waste Tool for Civil Engineering (Ref 20-28).

Table 20.13: Potential Recycled Content

Material Type	Potential Recycled Content (% by weight)
Concrete	16
Asphalt	25
Aggregates	50
Steel reinforcement	100
Structural steel	60

Future Baseline

20.5.4 There is no publicly available information on any potential long-term changes to national material demands by the time of construction of the Project. Construction material demand such as ready mixed concrete is closely aligned to both the quantity of construction taking place and the general economy. Therefore, it is deemed inappropriate to forecast future demand as it is unlikely to be linear. It is, therefore, not possible to set a future baseline for materials. As such, the future baseline is assumed during Project construction to be the same as the current baseline as outlined in **Table 20.11**.

Allocated/ Safeguarded Mineral and Waste Sites and MSAs

20.5.5 As outlined in the North East Lincolnshire Local Plan 2013 to 2032 (adopted 2018) (Ref 20-19) "*the area features some mineral deposits of economic importance, however, no primary extraction occurs in the Borough"*. However, *"significant existing and planned infrastructure identified on the Policies Map, that supports the supply of minerals in the Borough would be safeguarded against development that would unnecessarily sterilise or prejudice its use, including development of incompatible land uses nearby. This includes strategic rail freight links, sites for concrete batching, manufacture of coated materials and concrete*

products, and sites associated with the handling, processing, and distribution of substitute, recycled and secondary aggregate material."

20.5.6 There are no active mineral extraction "*sites in North East Lincolnshire contributing to primary aggregate production and the Council's call for sites has not identified any potential minerals sites*." Therefore, there are no allocated/ safeguarded mineral sites within the Site.

20.5.7 Three sites producing secondary and recycled aggregates are listed in the North East Lincolnshire Local Plan, noting that these sites are not within close proximity (over 1km) of the Site. There are no concrete batching/ aggregate sites within close proximity of the Site as outlined on the MSA and Waste Sites Policy Map (Ref 20-20).

20.5.8 North East Lincolnshire safeguard the existing waste management facilities identified on the Policies Map (Minerals and Waste) "*from the encroachment of incompatible development unless the planning permission has expired and/ or it can be demonstrated that the site is no longer required. The Council would seek to ensure that new development in proximity to a waste site is not incompatible with the waste management facility and would not prejudice its ongoing operation*". The details of waste sites adjacent or within the Site are presented in **Table 20.14**.

20.5.9 Consultation in relation to the safeguarding of allocated/ safeguarded waste sites in the vicinity of the Project would be required. However, permanent impacts upon allocated/ safeguarded waste sites are not anticipated: any Project impacts on site access would be of limited duration (during construction only), whilst alternative access arrangements would be put in place during this time in order to avoid undue disruption.

Table 20.14: Safeguarded Waste Sites Within or Adjacent to the Project

North East Lincolnshire Local Plan reference	Operator	Site Location	Details
WM05	Grimsby Operations Ltd	Household Waste Recycling Centre, Queens Road, Immingham	Adjacent to the Project.
WM07	Integrated Waste Management Ltd	Queens Road, Immingham	Access road to the permitted landfill is within the Site.

20.5.10 Three other safeguarded waste sites are located within 1km of the Site as presented in **Table 20.15**.

Table 20.15: Other Safeguarded Waste Sites Within 1km of the Project

North East Lincolnshire Local Plan Reference	Operator	Site Location
WM03	Associated British Ports	Immingham Dock Olive Residue Storage
WM08	Selvic Shipping Services Ltd and FBM Metals (UK) Ltd (licence name F B M Metals (UK) Ltd and F B M Holdings Ltd	Kiln Lane Treatment Plant, Netherlands Way, Stallingborough
WM09	SJP Trading Ltd (licence name Stokesley Metals Ltd)	Huckers Yard, Netherlands Way, Stallingborough

20.5.11 North East Lincolnshire has designated MSAs for sand and gravel and blown sand, however these areas are not located within close proximity of the Site (in the Stallingborough area and Habrough area over 4km away).

Landfill Capacity

Current Baseline

20.5.12 **Table 20.16** presents remaining landfill capacity at the end of 2020 as outlined on the EA's 2021 Waste Summary Tables for England – Version 1 (last updated 30th September 2022) (Ref 20-24) for the non-hazardous and inert waste expansive study area (East Midlands and Yorkshire and the Humber) and the hazardous waste study area (England).

20.5.13 Merchant landfills are operated for commercial purposes accepting waste from construction projects and operating businesses. Merchant landfills are therefore considered to form the baseline. In contrast, restricted landfills are sites that deal with their own produced waste (i.e. not operating for commercial purposes) and therefore additional capacity associated with such facilities is excluded from the baseline. Some non-hazardous landfill have a Stable Non-Reactive Hazardous Waste Cell (SNRHW) e.g. for asbestos.

Table 20.16: Landfill Capacity (2021) in East Midlands, Yorkshire and The Humber, and England

Landfill Type	Sub-Region			
	East Midlands	Yorkshire and the Humber	Total in East Midlands and Yorkshire and the Humber	England
	Capacity ('000s m^3)			
Hazardous Merchant	800	700	1,500	12,107
Non-hazardous with SNRHW cell	15,884	1,243	17,127	52,006
Non-hazardous	17,570	45,196	62,766	162,369
Inert	21,574	25,283	46,857	129,078
Sub-total (non-hazardous and inert)	55,028	71,722	126,750	12,107
Total	800	700	1,500	355,560

20.5.14 **Table 20.16** indicates that total non-hazardous and inert landfill capacity in the non-hazardous study area is 127 million m^3. Total hazardous landfill capacity in the hazardous waste study area is 15.6 million m^3.

Future Baseline

20.5.15 The EA has published landfill capacity trends for 2004 to 2021 in 2022 within the EA's 2021 Waste Summary Tables for England – Version 1 (last updated 30th September 2022) (Ref 20-24).

20.5.16 **Plate 20-1** presents the historic trend for the remaining landfill capacity for the East Midlands and Yorkshire and the Humber.

20.5.17 **Plate 20-2** presents the historic trend for remaining landfill capacity for England.

20.5.18 Data is only available for "Inert" (inert landfill only) and "Non-Inert" (non-hazardous landfill sites, non-hazardous landfill sites with a SNHRW cell and merchant hazardous landfill sites) therefore the categories do not align with the 2021 landfill capacity data which is split by hazardous, non-hazardous and inert as shown in **Table 20.16**.

Plate 20-1: Historic Trend for Landfill Void Capacity in East Midlands and Yorkshire and the Humber (Ref 20-24)

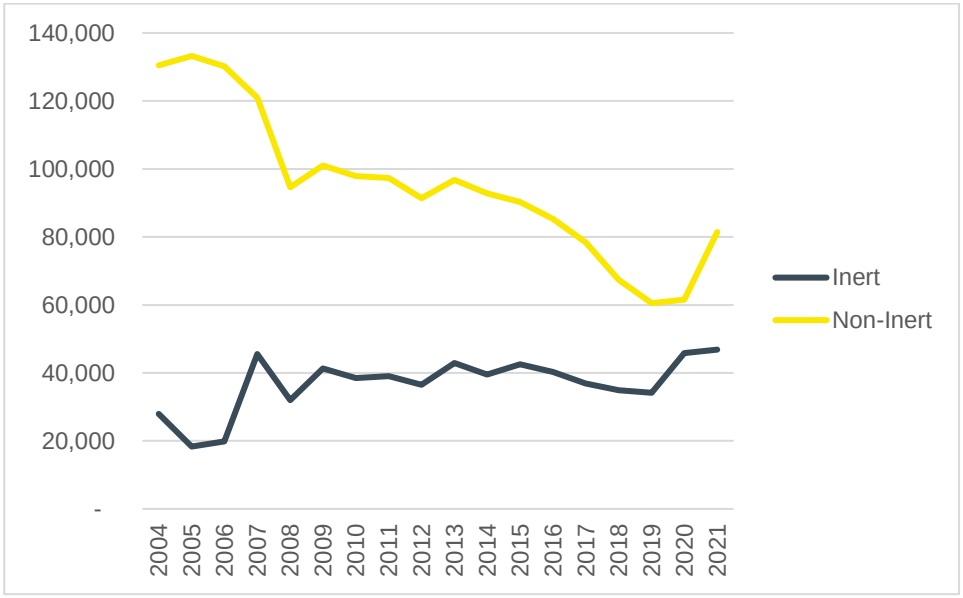
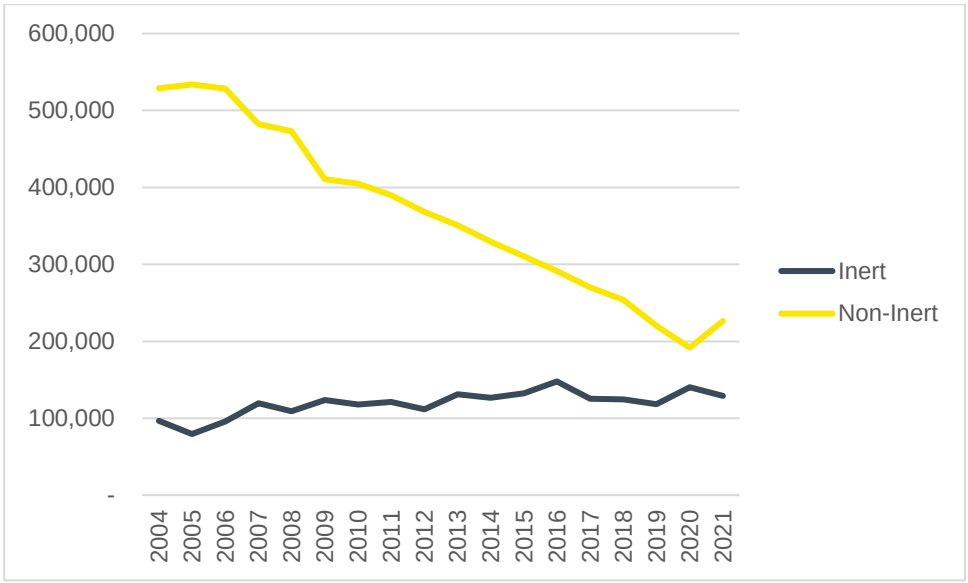


Plate 20-2: Historic Trend for Landfill Void Capacity in England (Ref 20-24)



20.5.19 There is no publicly available information on any potential changes to landfill capacity by the time of project construction. Due to the cyclic nature of inert landfill capacity, it is not realistic to forecast future landfill capacity since this may result in an increase in landfill capacity. Therefore, future inert landfill capacity during Project construction is assumed to be the same as the current baseline as outlined in **Table 20.16**.

20.5.20 For non-inert landfill (which includes hazardous waste) capacity using the current rate of decline of landfill capacity and forecasting into the future would lead to the inevitable conclusion that there would be no void space remaining. However, this is not a credible scenario as if there is still a need for landfill, then the WPA would need to consent new landfill capacity to replace that which has been used up.

Therefore, future non-hazardous and hazardous landfill capacity during Project construction is assumed to be the same as the current baseline as outlined in **Table 20.16**.

Waste Management Infrastructure

20.5.21 The permitted capacity of other types of waste infrastructure is publicly available (e.g. Environmental Permitting Regulations - Waste Sites (Ref 20-29)), however, the permitted capacity is not necessarily representative of the actual operational capacity of the infrastructure since waste inputs may not be as high as permitted capacity. Therefore, inputs data are collated from the EA's Waste Data Interrogator 2021 – Waste Received (Excel) – Version 1 (Ref 20-30) and presented in **Table 20.17**.

20.5.22 Inputs are not totalled since the double counting of waste in the Waste Data Interrogator cannot be discounted. Double counting results from the same waste making multiple movements through multiple facilities e.g., transfer station to treatment facility with residues going to an energy from waste plant.

Table 20.17: Summary of Waste Inputs by Facility Type (Ref 20-30)

Facility Type	East Midlands (tonnes received)	Yorkshire and the Humber (tonnes received)
Landfill	4,238,163	4,501,192
MRS	843,958	1,817,180
On/ In Land	551,542	1,397,745
Transfer	4,588,886	5,394,163
Treatment	7,389,323	14,703,527
Combustion	72,986	71,810
Incineration	1,006,895	2,908,832
Mining	4,575	752
Storage	146,905	315,692
Processing	185,618	534,065

20.5.23 The IEMA Guidance "*does not consider waste processing and recovery facilities as sensitive receptors, rather: they are part of a system that has the potential to reduce the magnitude of adverse impacts associated with waste generation and disposal. Waste processing and recovery facilities are, hence, different to landfills, in that the latter are finite resources*." Therefore, a full list of waste management infrastructure is not included in the baseline as presented herein.

Historic Landfills

20.5.24 Historic landfills are potentially relevant to this assessment since excavations in historic landfill can give rise to waste that would require appropriate management. The EA's Historic Landfill Sites spatial data (Ref 20-31) does not present any historic landfills in close proximity to the Project site. There is one historic landfill 100 metres to the north of the Project on the northern side of the railway line (i.e. Dock South East, Immingham). First waste inputs to the landfill occurred in 1986, whilst the licence was surrendered in 1990. The landfill was licensed to accept inert and industrial waste.

Targets

20.5.25 The national target for recovery of C&D waste is 70% by weight, as set out in the Waste FD and the Waste Management Plan for England (Ref 20-14). The target specifically excludes naturally occurring materials with European Waste Catalogue (EWC) Code 17 05 04 (soil and stones other than those mentioned in 17 05 03* (soils and stones containing dangerous substances)). Recovery is deemed to include reuse, recycling and other recovery e.g. energy recovery.

20.5.26 A good practice landfill diversion target of 90% has been achieved and exceeded by major UK developments as outlined in the IEMA Guidance. In 2018, the UK generated 67.8 million tonnes of non-hazardous C&D waste, of which 62.6 million tonnes was recovered. This represents a recovery rate of 92.3% (Ref 20-32).

20.5.27 Standard, good and best practice recovery rates by material are provided by Waste & Resources Action Programme (WRAP) (Ref 20-33). Recovery rates for key construction materials and other construction wastes relevant to the Project construction phase are provided in **Table 20.18**.

Table 20.18: Standard, Good and Best Practice Recovery Rates by Material

Material	Standard Practice Recovery (%)	Good Practice Recovery (%)	Best Practice Recovery (%)
Metals	95	100	100
Packaging	60	85	95
Concrete	75	95	100
Inert	75	95	100
Plastics	60	80	95
Miscellaneous	12	50	75
Electrical equipment	Limited information	70	95
Cement	Limited information	75	95
Liquids and oils	100	100	100

Material	Standard Practice Recovery (%)	Good Practice Recovery (%)	Best Practice Recovery (%)
Hazardous	50	Limited information, cannot be 100% since some hazardous waste e.g. asbestos must be landfilled.	

Receptor Sensitivity

20.5.28 Materials required for Project construction are determined to be receptors of 'low' sensitivity. On balance, the key materials required for the construction of the Project are forecast (through trend analysis and other information) to be generally free from known issues regarding supply and stock. Key materials required for the construction are likely to be available comprising a high proportion of sustainable features and benefits (e.g. recycled content).

20.5.29 Potential recycled content for the main Project construction materials are outlined in **Table 20.13**.

20.5.30 Waste receptors of relevance to the Project are determined to have a 'very high' sensitivity. Since there is no publicly available information on any potential changes to landfill capacity by the time of the Project construction and operation, a worst-case scenario has been considered.

20.5.31 It is assumed that (without the Project) non-hazardous landfill void capacity in the expansive study area is expected to:

a. Reduce very considerably (by >10%);
b. End during Project construction and operation;
c. Is already known to be unavailable; or
d. Would require new capacity or infrastructure to be put in place to meet forecast demand.

20.5.32 It is assumed that (without the Project) hazardous landfill void capacity in the expansive study area is expected to:

a. Reduce very considerably (by >1%), in the past there has been >1% reduction in landfill capacity;
b. End during Project construction and operation;
c. Is already known to be unavailable; or
d. Would require new capacity or infrastructure to be put in place to meet forecast demand.

20.6 Design, Mitigation and Enhancement Measures

Embedded Mitigation

20.6.1 As described in the IEMA Guidance, embedded (primary) mitigation is the prevention or reduction of adverse effects through the resource-efficient design, construction and/ or lifetime operation of a project.

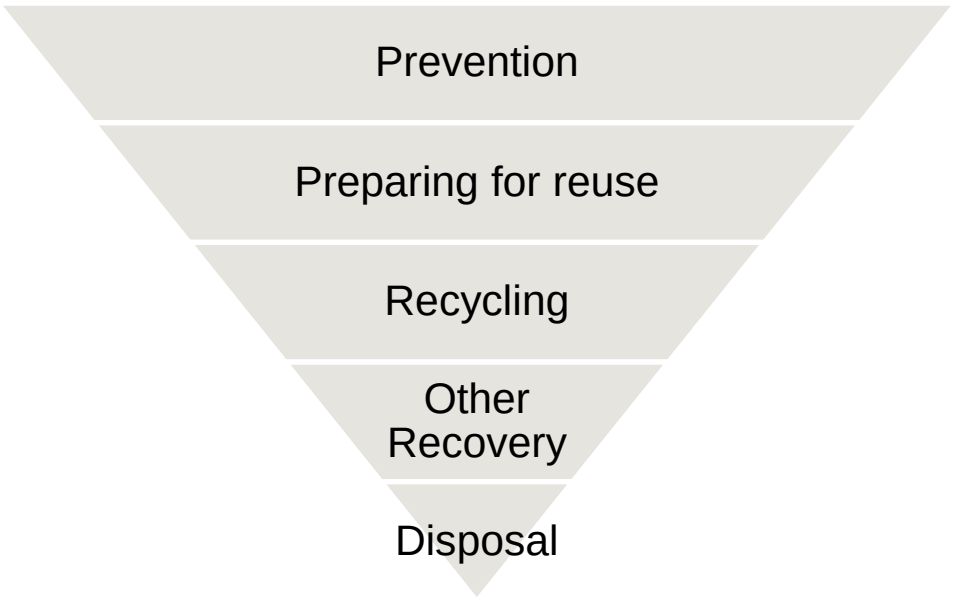
20.6.2 Primary mitigation measures are an intrinsic part of the Project, and do not require additional action to be taken. Such measures are often identified as a

result of the interaction between the environmental and engineering specialists within a project team, who are able to identify and agree by consensus resource-efficient design solutions.

20.6.3 Embedded mitigation measures of relevance to materials and waste for the Project are described below.

20.6.4 The Project will aim to prioritise waste prevention, followed by preparing for re-use, recycling and recovery and lastly waste disposal to landfill as per the waste hierarchy as detailed in **Plate 20-3**.

Plate 20-3: The Waste Hierarchy, from Defra's Guidance on Applying the Waste Hierarchy, recreated by AECOM (Ref 20-34)



20.6.5 The following designing out waste mitigation measures will be considered and implemented where applicable during the Project design and subsequent construction phase:

a. Design for reuse and recovery: identifying, securing and using materials that already exist on site, or can be sourced from other projects.

b. Design for materials optimisation: simplifying the Project layout and form to minimise material use, using standard design parameters, balancing cut and fill, maximising the use of renewable materials and materials with recycled content.

c. Design for off-site construction: maximising the use of pre-fabricated structures and components, encouraging a process of assembly rather than construction.

d. Design for the future (deconstruction and flexibility): identify how materials can be designed to be more easily adapted over an asset lifetime and how deconstructability and demountability of elements can be maximised at end of first life.

e. Design for materials and waste efficient procurement: identify and specify materials that can be acquired responsibly, in accordance with a recognised industry standard.

20.6.6 As per the IEMA Guidance embedded measures are considered prior to the assessment of effects to avoid considering assessment scenarios that are unrealistic in practice i.e. do not take account of such measures even though they are likely to be standard practice (tertiary mitigation) and/ or form part of the Project design (embedded mitigation). Taking these measures into account means that realistic likely environmental effects are identified. Where likely significant adverse effects are identified after considering these embedded measures, Project specific mitigation measures will be considered, developed and proposed, where necessary and possible.

20.6.7 All mitigation by design measures will be described within the ES with the rationale for the inclusion of the identified embedded measures clearly stated.

Standard Mitigation

20.6.8 As described in the IEMA Guidance, additional (secondary) mitigation are actions that require further activity in order to achieve the anticipated outcome. These may be imposed as part of the consent or requirement, or through inclusion in an environmental management plan.

20.6.9 Construction of the Project would be subject to measures and procedures defined within a Construction Environmental Management Plan (CEMP), which would be produced prior to the commencement of construction by the Contractor and would be based on, and incorporate, the contents and requirements of the outline CEMP which will be submitted with the DCO Application. In addition, an Outline Site Waste Management Plan (OSWMP) will be prepared and accompany the DCO application. The Contractor will prepare a Site Waste Management Plan (SWMP) before the commencement of construction, as based upon the OSWMP. The OSWMP would set out the generic measures that will be implemented by the Contractor to manage waste generated by the Project construction. This OSWMP would include:

a. An overview of applicable legislation;

b. Details of the Project;

c. Management arrangements, including roles and responsibilities, training, targets and best practice measures;

d. Estimates of construction material use and waste arising and how they will be managed;

e. Design decisions;

f. Materials and waste management on-site; and

g. Opportunities for waste minimisation, reuse, recycling and recovery in line with the requirements of the waste hierarchy.

20.6.10 Targets for waste recovery and recycled content will be included in the contractor's SWMP and could include for example:

a. Achieving a set percentage (by weight) for recovery of non-hazardous C&D waste. Such a target would specifically exclude naturally occurring materials with EWC Code 17 05 04 (soil and stones other than those mentioned in 17 05 03* (soils and stones containing dangerous substances)). Recovery is deemed to include reuse, recycling and other recovery e.g. energy recovery.

b. Achieving a set percentage (by weight) of materials imported to site for use within the Project containing alternative (reused, recycled or secondary) content, for those applications where it is technically and economically feasible to substitute these alternatives to primary materials.

20.6.11 The reuse of excavated material would be covered by a CL:AIRE DoW CoP (Ref 20-21) MMP developed by the Contractor before the commencement of construction and for obtaining all necessary approvals (in accordance with the OEMP). This would support the re-use of excavated materials, minimise off-site disposal; and to demonstrate the necessary lines of evidence to support the proper reuse/ offsite disposal of materials and ensure compliance with regulatory guidance.

20.7 Potential Impacts and Effects

Potential Impacts

20.7.1 Potential materials and waste impacts associated with the Project include:

a. Reduction in materials required for construction available in the relevant markets (key construction materials e.g. concrete, asphalt, steel, aggregates).

b. Effects that on-site generated materials (e.g. soils, waste arisings) have on the existing and future landfill void capacity during Project construction.

c. Effects that on-site generated waste arisings have on the existing and future landfill void capacity during Project operation.

d. Changes to allocated/ safeguarded waste site access.

Construction

20.7.2 **Table 20.19** summarises the likely types of materials that would be used and wastes that are likely to be generated during the Project construction phase.

Table 20.19: Construction Material Use and Waste Types Arising from Project Construction

Construction Activity	Materials Used	Waste Types Generated
Site remediation/ preparation/ earthworks	Fill material for construction purposes. Primary/secondary/recycled aggregates for ground stabilisation. Topsoil and subsoil for landscaping and restoration.	Surplus excavated materials. Surplus topsoil and subsoil. Unsuitable and contaminated soils and excavated materials. Vegetation from site clearance.
Site clearance and demolition activities	Materials are not required for demolition works.	Waste arisings from demolition and clearance. Extensive demolition is not anticipated as the site is either hardstanding, brownfield or agricultural field.
Site construction	Main construction materials including: • Concrete • Steel • Pipe supports • Cables, cable trays and instruments • Asphalt • Piles • Gravel • Fill material	Excess, offcuts and broken/ damaged construction materials. Existing infrastructure removed during works. Packaging from materials delivered to site e.g. timber crates. Construction worker wastes from offices and welfare areas/ canteens. Waste oils from construction plant.

Construction Materials

20.7.3 The estimated main types and quantities of materials anticipated to be used during construction of the various Project phases (Phase 1-6) have been obtained from the Applicant and AP, as presented in **Table 20.20**, **Table 20.21** and **Table 20.22** alongside national and regional materials consumption. Regional material consumption is not available for steel.

20.7.4 Phase 1 is anticipated to be three years (2025-2027), each subsequent phase (2-6) would be two years each. Phase 4 (2031 and 2032), Phase 5 (2032 and 2033) and Phase 6 (2033 and 2035) are anticipated to overlap by one year. A worst case that all material used and waste generation occurs within one year for each phase is taken in the assessment.

20.7.5 Table 20.21These tables also include potential material wastage estimates and a total construction waste estimate based on material wastage only. The estimates are preliminary and would be updated as appropriate in the ES. Asphalt material quantities have been converted from m^2 to m^3 by applying an indicative material depth of 170mm.

20.7.6 Data on the bulk density of materials has been used to convert quantities between volume (m^3) and weight (tonnes). Information on the typical bulk density of materials has been sourced from WRAP's Designing Out Waste Tool for Civil Engineering (Ref 20-28).

20.7.7 The estimated wastage rates for each material are based on the "good practice" rates from WRAP's Designing Out Waste Tool for Civil Engineering (Ref 20-28).

Table 20.20: Estimated Construction Material Quantities and Wastage – Terminal Phase 1

Material	Material Density (t/m^3)	Quantity (tonnes)	Quantity (m^3)	National Material Consumption (million tonnes)	% of National Material Consumption and Magnitude	Regional Material Consumption (million tonnes)	% of Regional Material Consumption	Wastage Rate (%)	Waste Quantity (tonnes)	Waste Quantity (m^3)
Concrete	2.4	128,880	53,700	86.2	**0.15**	2.6	**4.96**	2.5	3,222	1,343
Steel - rebar	7.85	6,900	879	17	**0.04**	n/a	**n/a**	5	345	44
Steel - structural	7.85	6,900	879	17	**0.04**	n/a	**n/a**	0	-	-
Asphalt	2.4	6,477	2,699	25.4	**0.03**	4.9	**0.13**	2.5	162	67
Aggregates - gravel	1.9	4,290	2,258	250.9	**0.002**	46.4	**0.01**	5	215	113
Aggregates - fill material	1.9	100,000	52,632	250.9	**0.04**	46.4	**0.22**	5	5,000	2,632
Total material construction waste based on wastage									8,943	4,198

Table 20.21: Estimated Construction Material Quantities and Wastage – Terminal Each Subsequent Phases (2-6)

Material	Material Density (t/m^3)	Quantity (tonnes)	Quantity (m^3)	National Material Consumption (million tonnes)	% of National Material Consumption	Regional Material Consumption (million tonnes)	% of Regional Material Consumption	Wastage Rate (%)	Waste Quantity (tonnes)	Waste Quantity (m^3)
Concrete	2.4	21,480	8,950	86.2	**0.02**	2.6	**0.83**	2.5	537	224
Steel - rebar	7.85	1,050	134	17	**0.01**	n/a	**n/a**	5	53	7
Steel - structural	7.85	1,250	159	17	**0.01**	n/a	**n/a**	0	-	-
Asphalt	2.4	1,554	648	25.4	**0.01**	4.9	**0.03**	2.5	39	16
Aggregates - gravel	1.9	950	500	250.9	**0.0004**	46.4	**0.002**	5	48	25
Aggregates - fill material	1.9	-	-	250.9	-	46.4	-	5	-	-
Total material construction waste based on wastage									676	272

Table 20.22: Estimated Construction Material Quantities and Wastage – Jetty

Material	Material Density (t/m^3)	Quantity (tonnes)	Quantity (m^3)	National Material Consumption (million tonnes)	% of National Material Consumption	Regional Material Consumption (million tonnes)	% of Regional Material Consumption	Wastage Rate (%)	Waste Quantity (tonnes)	Waste Quantity (m^3)
Concrete	2.4	58,206	24,253	86.2	**0.07**	2.6	**2.24**	2.5	1,455	606
Steel - rebar	7.85	4,714	601	17	**0.03**	n/a	**n/a**	5.0	236	30
Steel - piles	7.85	14,947	1,904	17	**0.09**	n/a	**n/a**	0	-	-
Total material construction waste based on wastage									1,691	636

20.7.8 On a national scale during the Terminal Phase 1 construction phase no individual construction material requirement is equal to or greater than 1% by weight of the baseline national consumption (UK/GB) (i.e. concrete 0.15%, steel 0.08%, asphalt 0.03% and aggregates 0.042% as shown in **Table 20.20**).

20.7.9 Materials required for Project construction are determined to be receptors of low sensitivity (in accordance with **Table 20.3**).

20.7.10 The magnitude of impact is considered to be negligible (in accordance with **Table 20.5**). The overall effect is therefore assessed to be neutral which is not significant.

20.7.11 On a regional scale during Terminal Phase 1 construction, asphalt and aggregates requirements are less than 1% by weight of the baseline regional consumption (i.e. asphalt 0.13% and aggregates 0.22% as shown in **Table 20.20**). Concrete requirements represent between 1-5% of the baseline regional consumption (i.e. concrete 4.96% as shown in **Table 20.20**). The effect is therefore assessed to be neutral which is not significant. The magnitude of impact for concrete is considered to be minor. The effect is therefore assessed to be slight adverse which is not significant.

20.7.12 Since material quantity requirements for subsequent Project phases (2-6) are lower than those required during Phase 1 and no individual construction material requirement is equal or greater than 1% at a national or regional scale (as outlined in **Table 20.21**) no significant effects are anticipated.

20.7.13 At a national scale during jetty construction, no individual construction material requirements are equal to or greater than 1% by weight of the baseline national consumption (UK/GB) (i.e. concrete 0.07% and steel 0.12% as outlined in **Table 20.22**). The magnitude of impact is considered to be negligible. The effect is therefore assessed to be neutral which is not significant.

20.7.14 At a regional scale during jetty construction, concrete requirements are between 1-5% of the baseline regional consumption (i.e. concrete 2.24% as outlined in **Table 20.22**). The magnitude of impact is considered to be minor. The effect is therefore assessed to be slight adverse which is not significant.

20.7.15 At a national scale in a worst-case scenario that Terminal Phase 1, Phase 2-6 and the jetty are constructed within a single year no individual construction material requirement is equal to or greater than 1% by weight of the baseline national consumption (UK/GB) (i.e. concrete 0.34%, steel 0.26%, asphalt 0.06% and aggregates 0.04%). The magnitude of impact is considered to be negligible. The overall effect is therefore assessed to be neutral which is not significant.

20.7.16 At a regional scale in a worst-case scenario that Terminal Phase 1, Phase 2-6 and the jetty are constructed within a single year asphalt and aggregates requirements are less than 1% by weight of the baseline regional consumption (as outlined in **Table 20.23**). Concrete requirements represent more than 10% of the baseline regional consumption (i.e. concrete 11.3% as outlined in **Table 20.23**).

20.7.17 For asphalt and aggregates the magnitude of impact is considered to be negligible. The overall effect is therefore assessed as neutral which is not significant. For concrete the magnitude of impact is considered to be major,

sensitivity is low. The effect is therefore assessed to be slight which is not significant. Slight adverse is selected rather than moderate since 11.3% is just over 10% of the baseline regional consumption.

Table 20.23: Estimated Construction Material Quantities and Wastage – Terminal Phase 1, Five Subsequent Phases and Jetty Total

Material	Material density (t/m^3)	Quantity (tonnes)	Quantity (m^3)	National material consumption (million tonnes)	% of National Material Consumption	Regional Material Consumption (million tonnes)	% of Regional Material Consumption	Wastage rate (%)	Quantity (tonnes)	Quantity (m^3)
Concrete	2.4	294,486	122,703	86.2	**0.34**	2.6	**11.3**	2.5	7,362	3,068
Steel	7.85	44,962	5,728	17	**0.26**	n/a	**n/a**	5.0	2,248	286
Asphalt	2.4	14,249	5,937	25.4	**0.06**	4.9	**0.29**	2.5	356	148
Aggregates	1.9	109,040	57,389	250.9	**0.04**	46.4	**0.24**	5.0	5,452	2,869
Total material construction waste based on wastage									**15,418**	**6,372**

Construction Waste

20.7.18 The construction waste estimates based upon wastage from construction material is likely to be an underestimation of total construction waste (i.e. 4,198 m^3 for terminal Phase 1, 272 m^3 for each subsequent terminal phase and 636 m^3 for the jetty) as this does not include worker waste, waste from vehicles etc. Therefore, construction waste volumes have also been estimated at a high-level based on the Project construction value.

20.7.19 The construction waste estimates (excluding demolition and excavation) have been calculated based on the construction value (£250 million for terminal Phase 1, £80 million for subsequent terminal phases and £60 million for the jetty) and published standard, good and best practice benchmarks for industrial buildings of 20.9m^3, 8.6m^3 and 5.5 m^3 waste per £100,000 respectively (Ref 20-35).

20.7.20 Construction waste volumes for terminal Phase 1 are estimated to be between 13,750 m^3 and 52,250 m^3, for subsequent terminal phases at between 4,400 m^3 and 16,720 m^3, and for the jetty at between 3,300 to 12,540 m^3. In a worst case that Terminal Phase 1, Phase 2-6 and the jetty are constructed within a single year construction waste volume is estimated to be between 38,500 m^3 and 148,390 m^3. These standard benchmark construction waste estimates have been used in the assessment as a worst case (148,390 m^3)

20.7.21 A worst-case scenario where all waste is disposed of to landfill has been applied. During construction this equates to 0.12% of the 127 million m^3 of inert and non-hazardous landfill capacity within the waste management study area (East Midlands and Yorkshire and the Humber). In practice a large proportion of non-hazardous and inert waste from the Project would likely to be recovered rather than disposed of to landfill, further reducing the overall quantities of waste requiring disposal.

20.7.22 Based on the above, construction of the Project is likely to result in less than a 1% (1,267,500 m^3) reduction of landfill capacity within the waste management study area, thus representing a negligible magnitude of impact.

20.7.23 Waste receptors of relevance to the Project are determined to have a very high sensitivity. Therefore, a negligible magnitude of impact is assessed to result in a slight adverse effect which is not significant.

20.7.24 At this stage no estimates of hazardous waste generation during Project construction are available. The quantities of hazardous waste (e.g. oils, batteries, aerosol cans etc.) are currently anticipated to be small compared to the overall construction waste arisings and anticipated to be less than 0.1% of the hazardous waste landfill capacity in England (12,107 m^3) – as such the magnitude of impact is anticipated to be negligible.

20.7.25 Many hazardous waste types have well defined waste management routes, including recovery and are unlikely to be sent directly to landfill. Procedures for the storage and management of these wastes will be set out in the OSWMP which will accompany the DCO application, and further detailed in the Contractor's SWMP. Hazardous waste receptors have a very high sensitivity'. Therefore, a negligible magnitude of impact would result in a slight adverse effect which is not significant.

Demolition and Clearance Waste

20.7.26 Demolition works during the construction phase are not anticipated given that the Project site comprises hardstanding, brownfield and agricultural field. Therefore, quantities of waste generated during site clearance activities are anticipated to be small.

20.7.27 The quantity of waste estimated to arise from vegetation clearance for Phase 1 is based on the number of hectares (ha) expected to be cleared (approximately 45 ha), the vegetation type (heavily wooded, medium wood or open field) and a benchmark for m^3 and tonnes of waste per ha. The vegetation type is not yet confirmed so all three benchmarks have been applied to provide a range. The benchmarks are:

a. Heavily wooded - 429 m^3 per ha, 300 tonnes per ha.

b. Medium wooded – 250 m^3 per ha, 175 tonnes per ha.

c. Open field – 9 m^3 per ha, 6 tonnes per ha.

20.7.28 Taking into account the above, during vegetation clearance works it is estimated that between 405 and 19,305 m^3 of material would be generated. It is anticipated that all of this waste would be composted or recovered on or off site with a 100% recovery rate and therefore would not impact landfill void capacity.

Excavated Material

20.7.29 The Project design is currently being progressed to optimise the requirements for cut and fill and where possible this will be minimised to reduce the import and export of materials and waste. The Project design team aim is to achieve a cut-fill balance, however predicted cut and fill for the Project is currently imbalanced with import required i.e. cut volume of approximately 45,000 m^3 and a fill volume of approximately 100,000 m^3.

20.7.30 The use of site-sourced excavated material within the Project engineering works activities would be undertaken in accordance with the MMP. This would be prepared by the Contractor in accordance with the CL:AIRE DoW CoP (Ref 20-21) with the material not being classified as waste.

20.7.31 Under a worst-case scenario where all approximately 45,000 m^3 of excavated material is sent to landfill has been applied. It is currently assumed that this material is non-hazardous. This equates to 0.04% of the 127 million m^3 of inert and non-hazardous landfill capacity within the waste management study area (East Midlands and Yorkshire and the Humber). When this is added to the construction waste estimate this equates to 0.15% of the 127 million m^3 of inert and non-hazardous landfill capacity within the waste management study area (East Midlands and Yorkshire and the Humber).

20.7.32 In practice, it is likely that some of the excavated material could be reused on-site or recovered, rather than being disposed of to landfill. Information on previously developed land and potential sources of contamination that could give rise to materials and waste that require specific handling, storage and management arrangements, are set out in **Chapter 21: Ground Conditions and Land Quality**.

20.7.33 Based on the above, construction of the Project is estimated to result in less than a 1% (1,040,110 m^3) reduction of landfill capacity within the waste management study area, representing a negligible magnitude of impact.

20.7.34 Waste receptors of relevance to the Project are determined to have a very high sensitivity. Therefore, a negligible magnitude of impact would result in a slight adverse effect which is **not significant**.

Impacts on Safeguarded Waste Sites

20.7.35 An access road to a permitted (allocated/ safeguarded) landfill is located within the Project site, whilst an allocated/ safeguarded waste site is located adjacent to the Project site. Consultation in relation to the safeguarding of allocated/ safeguarded waste sites in the vicinity of the Project would be required. However, permanent impacts are not anticipated given that any impacts on site access would be of limited duration (during construction only), whilst alternative access arrangements would be put in place during this time in order to avoid significant effects.

Operation

20.7.36 Effects associated with the availability of materials during Project operation have been scoped out of the assessment.

20.7.37 Details of operational waste are not yet finalised; however, it is anticipated that operation of the Project is likely to result in less than a 1% (1,267,500 m^3) reduction of landfill capacity within the waste management study area, representing a negligible magnitude of impact.

20.7.38 Waste receptors of relevance to the Project are determined to have a very high sensitivity. Therefore, a negligible magnitude of impact would result in a slight adverse effect which is **not significant**.

Residual Effects

20.7.39 Based upon the assessment as detailed above, no significant residual effects with regard to materials and waste are anticipated.

20.8 Summary of Preliminary Assessment

20.8.1 Based on the current understanding of material and waste quantities associated with the Project, no significant effects are anticipated. Estimates of material and waste quantities will be further refined as the Project design progresses, therefore, the likely effects of the Project on materials and waste will be reconsidered and reported within the ES.

20.8.2 A summary of potential materials and waste impacts, mitigation measures and residual effects is presented in **Table 20.24**.

Table 20.24: Summary of Potential Impact, Mitigation Measures and Residual Effects

Receptor	Impact Pathway	Effect Significance	Mitigation Measures	Residual Effect	Confidence
Construction Phase					
Waste - Non-hazardous landfill void capacity in the expansive study area of East Midlands and Yorkshire and the Humber.	Changes in available landfill capacity.	The sensitivity of the receptor is classified as very high, with a negligible magnitude of impact resulting in a slight adverse effect which is not significant.	Mitigation outlined in **Section 20.6**.	'Slight adverse' effect which is not significant.	Confidence level of significance of effects prediction is moderate-high.
Waste - Hazardous landfill void capacity in the expansive study area England.	Changes in available landfill capacity.	The sensitivity of the receptor is classified as very high, with a negligible magnitude of impact resulting in a slight adverse effect which is not significant.	Mitigation outlined in **Section 20.6**.	'Slight adverse' effect which is not significant.	Confidence level of significance of effects prediction is moderate-high.
Materials - national and regional consumption of key construction materials.	Changes in demand for materials.	The sensitivity of the receptor is classified as low, with a minor or negligible (dependent on material type) magnitude of impact resulting in a neutral adverse or slight adverse effect (dependent on material type) which is not significant.	Mitigation outlined in **Section 20.6**.	'Neutral adverse' or 'slight adverse' effect (dependent on material type) which is considered to be not significant.	Confidence level of significance of effects prediction is moderate-high.

Receptor	Impact Pathway	Effect Significance	Mitigation Measures	Residual Effect	Confidence
Waste – Safeguarded waste sites.	Impacts on safeguarded waste sites and associated access.	Impacts on safeguarded waste sites and associated access are to be confirmed. Safeguarded waste sites will be considered further in the ES however permeant impacts are not anticipated.	Mitigation outlined in **Section 20.6**.	Impacts on safeguarded waste sites and associated access are to be confirmed. Safeguarded waste sites will be considered further in the ES however permeant impacts are not anticipated.	Confidence level of significance of effects prediction is low since impacts on safeguarded waste sites and associated access are to be confirmed.
Operational Phase					
Waste - Non-hazardous landfill void capacity in the expansive study area of East Midlands and Yorkshire and the Humber.	Changes in available landfill capacity.	The sensitivity of the receptor is classified as very high, with a negligible magnitude of impact resulting in a slight adverse effect which is not significant.	Mitigation outlined in **Section 20.6**.	Slight adverse' effect which is not significant.	Confidence level of significance of effects prediction is low since operational waste quantities are not yet known.
Waste - Hazardous landfill void capacity in the expansive study area England.	Changes in available landfill capacity.	The sensitivity of the receptor is classified as very high, with a negligible magnitude of impact resulting in a slight adverse effect which is not significant.	Mitigation outlined in **Section 20.6**.	Slight adverse' effect which is not significant.	Confidence level of significance of effects prediction is low since operational waste quantities are not yet known.

20.9 References

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Ref 20-35 WRAP, (undated), SMARTWaste Data and Reporting (projects completed at the end of November 2012).

20.10 Abbreviations and Glossary of Terms

Table 20.25: Glossary and Abbreviations

Term	Acronym	Meaning
Air Products BR Ltd	AP	A world-leading industrial gases company that develops, engineers, builds, owns and operates some of the world's largest industrial gas projects.
Construction & Demolition waste	C&D waste	A wide variety of materials such as concrete, bricks, wood, glass, metals, and plastic. It includes all the waste produced by the construction and demolition of buildings and infrastructure.
Construction Environmental Management Plan	CEMP	A Construction Environmental Management Plan describes the specific mitigation measures to be followed by the appointed construction contractor to reduce potential nuisance impacts.
Contaminated Land: Applications in Real Environments	CL:AIRE	A UK charity which develops training resources, disseminates information, and acts as a resource for those involved in sustainable land reuse.
Definition of Waste: Code of Practice	DoW:CoP	Following the code of practice enables the direct transfer and reuse of clean naturally occurring soil materials between sites.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Department of Environment and Rural Affairs	Defra	The Government department responsible for policy and regulations on environmental, food and rural issues.
Environment Agency	EA	Government agency established to protect and improve the environment and contribute to sustainable development in England. Responsibilities include: water quality and resources, flooding and coastal risk management and contaminated land.
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
European Waste Catalogue	EWC	The European Waste Catalogue is a hierarchical list of waste descriptions established by Commission Decision 2000/532/EC.

Term	Acronym	Meaning
Framework Directive	FD	A European Directive which sets the basic concepts and definitions related to waste management, including definitions of waste, recycling, and recovery.
Great Britain	GB	The nations of England, Scotland, and Wales.
Hectare	ha	Unit of area equal to 10,000 square metres.
Institute of Environmental Management and Assessment	IEMA	A professional body for practitioners working in the fields of environmental management and assessment.
Materials Management Plan	MMP	A mechanism by which those who are developing a site can comply with EA regulations for excavated ground materials.
Mineral Planning Authority	MPA	Typically, the county council (in two-tier parts of the country), the unitary authority, or the national park authority that deal with mineral planning issues within their area.
Mineral Safeguarding Area	MSA	An area designated by MPAs which covers known deposits of minerals, which are desired to be kept safeguarded from unnecessary sterilisation by non-mineral development.
National Planning Policy Framework	NPPF	A planning framework which sets out the Government's planning policies for England and how these are expected to be applied.
National Planning Practice Guidance	NPPG	This is a web-based resource used to support the National Planning Policy Framework.
National Policy Statement for Ports	NPSfP	The National Policy Statement for Ports provides the framework for decisions on proposals for new port development,
Outline Environmental Management Plan	OEMP	Outlines how actions might impact on the natural environment in which they occur and sets out commitments from the person taking the actions on how those impacts will be avoided, minimised, and managed.
Outline Site Waste Management Plan	OSWMP	Outlines the procedures for managing hazardous and non-hazardous waste on a construction site.
Preliminary Environmental Information	PEI	The information referred to in Part 1 of Schedule 4 of the EIA Regulations that has been reasonably compiled by the applicant and is reasonably required to assess the environmental effects of a project.

Term	Acronym	Meaning
Stabilised Non-Reactive Hazardous Waste	SNRHW	A range of solidified hazardous wastes (such as those that have been mixed with cement or Pulverised Fuel Ash) or granular solid wastes produced by a variety of treatment plants.
Site Waste Management Plan	SWMP	Details and confirms the procedures for managing hazardous and non-hazardous waste on a construction site.
United Kingdom	UK	-
Waste Framework Directive	Waste FD	The Waste Framework Directive sets the basic concepts and definitions related to waste management, including definitions of waste, recycling and recovery.
Waste Planning Authority	WPA	Typically, the county council (in two-tier parts of the country) or the unitary authority that deal with waste planning issues within their area.
Waste & Resources Action Programme	WRAP	A charity which works with businesses, individuals, and communities to achieve a circular economy, by helping them reduce waste, develop sustainable products, and use resources in an efficient way.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 21: Ground Conditions and Land Quality

Associated British Ports

Document History

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Table of contents

Tables

21 Ground Conditions and Land Quality

21.1 Introduction

21.1.1 This chapter presents the preliminary findings of the Preliminary Environmental Information (PEI) assessment of the likely effects of the Project in relation to Ground Conditions and Land Quality.

21.1.2 There may be interrelationships related to the potential effects on Ground Conditions and Land Quality and other disciplines. Therefore, refer to the following chapters in Volume II of the PEI Report:

a. **Chapter 8: Nature Conservation (Terrestrial Ecology).**
b. **Chapter 9: Nature Conservation (Marine Ecology).**
c. **Chapter 10: Ornithology.**
d. **Chapter 16: Physical Processes.**
e. **Chapter 17: Marine Water and Sediment Quality.**
f. **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage.**
g. **Chapter 22: Major Accidents and Disasters.**

21.1.3 This chapter is also supported by the following figures contained in Volume III of the PEI Report:

a. **Figure 1.1** Site Location Plan;
b. **Figure 2.1** Site Plan;
c. **Figure 21.1** Superficial Geology and Artificial Geology (including study area);
d. **Figure 21.2** Bedrock Geology (including study area);
e. **Figure 21.3** Groundwater Features (including study area);
f. **Figure 21.4** West Site Constraints Plan;
g. **Figure 21.5** East Site Constraints Plan; and
h. **Figure 21.6** Source Protection Zones (including study area).

21.2 Approach to Assessment

Scope and Methods

21.2.1 A scoping exercise was undertaken in August 2022 to establish the form and nature of the Ground Conditions and Land Quality assessment, and the approach and methods to be followed.

21.2.2 The Scoping Report (**Appendix 1.A** of PEI Report Volume IV) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on Ground Conditions and Land Quality.

21.2.3 Following receipt of the Scoping Opinion (**Appendix 1.B** of PEI Report Volume IV) as to the information to be provided in the Environmental Statement (ES), the following requirements have been identified by the Planning Inspectorate which will be taken into account as part of the ongoing Ground Conditions and Land Quality assessment:

a. The Agricultural Land Classification (ALC) should be confirmed in the ES based on a recognised approach such as Natural England's Technical Information Note TIN049 Agricultural Land Classification: Protecting the best and most versatile agricultural land. The Planning Inspectorate recommend that the ES should demonstrate how areas of the best and most versatile land have been avoided in the proposed development. An ALC survey will be undertaken prior to the submission of the ES to confirm the subgrades of Grade 3 land and inform the assessment in the ES chapter; and

b. Guidance documents referred to for the assessment of Ground Conditions and Land Quality should include the following:

   i. Ministry of Agriculture, Fisheries and Food (1988): The Agricultural Land Classification of England and Wales: revised guidelines and criteria for grading the quality of agricultural land;

   ii. Natural England (2012) Technical Information Note TIN049 Agricultural Land Classification: Protecting the best and most versatile agricultural land; and

   iii. Institute of Environmental Management and Assessment (IEMA) Guide: A New Perspective on Land and Soil in Environmental Impact Assessment.

21.2.4 Having regard to the information presented within the Scoping Report (**Appendix 1.A** of PEI Report Volume IV), the Planning Inspectorate's Scoping Opinion (**Appendix 1.B** of PEI Report Volume IV) has also confirmed the Applicant's view that significant effects on soil during the operational phase are unlikely as any potential impacts would have occurred during the construction phase. Accordingly, this matter will remain scoped out of consideration in the ES.

21.2.5 Consultation has been undertaken with the following stakeholders to discuss any further potential issues relating to ground conditions and land quality that may not be available within the public domain:

a. Environment Agency (EA);

b. Coal Authority;

c. Natural England;

d. English Heritage;

e. Immingham Town Council;

f. Lincolnshire Council;

g. North East Lincolnshire Council (NELC);

h. Crown Estate;

i. The Port Authority; and

j. Marine Management Organisation.

21.2.6 A summary of the scoping opinions received is provided in **Table 21.1.**

Table 21.1 Scoping Opinion Comments on ground conditions and land quality

Consultee	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	The Scoping Report proposes to scope out impacts on soil during the operational phase as any effects would have already occurred during construction. The Inspectorate agrees that new effects on soils would be likely to occur during normal operations and therefore this matter can be scoped out of the ES.	No response required
	The Scoping Report states that an Agricultural Land Classification survey may be required to determine the subdivision of land classified as Grade 3 into either Grade 3a or 3b. The ES should confirm the agricultural land grade based on a recognised approach (such as Natural England's TIN049) and demonstrate how the Proposed Development has sought to avoid use of areas of best and most versatile land. The impact of the Proposed Development on existing farming activities in the area should also be explained in the ES.	The ALC for the site is defined in the baseline section and an ALC survey is recommended in the PEI Report as part of the mitigation during the construction phase.
	Paragraph 20.6.9 on 'relevant legislation, policy and technical guidance' focuses on legislation and policy. The ES should list the guidance applied. Where relevant, the ES should take into account the following guidance: •Ministry of Agriculture, Fisheries and Food (1988) The Agricultural Land Classification of England and Wales: revised guidelines and criteria for grading the quality of agricultural land. •Natural England (2012) Technical Information Note TIN049, Agricultural Land Classification: protecting the best and most versatile agricultural land •Stapleton, C., Reed, E., Gemmell, L., Adams, K. (eds) (2021) IEMA Guide: A New Perspective on Land and Soil in Environmental Impact Assessment.	The recommended guidance list has been added to the PEI Report and will be included and summarised in the ES.
Environment Agency	We have reviewed this chapter and can advise that we are satisfied with the scope	No response required

Consultee	Summary of Response	How comments have been addressed in this chapter
	and methodology proposed to assess ground conditions and land quality.	
The Coal Authority	The Coal Authority have confirmed that the site is located within a coalfield. However, the site is not located within a Development High Risk Area. There are no recorded coal mining legacy hazards at depth. Therefore, the Coal Authority consider that no further consideration to a coal mining legacy as part of the ES and there is no requirement to contact the Coal Authority regarding the planning application.	The response from the Coal Authority has been noted. **Paragraph 21.3.37** provides information on coal mining for the proposed development site boundary.
	It is recommended to include the following text if planning permission is granted as part of the formal application: "*The proposed development lies within a coal mining area which may contain unrecorded coal mining related hazards. If any coal mining feature is encountered during development, this should be reported immediately to the Coal Authority on 0345 762 6848"*.	The baseline section of the PEI Report provides information on the geology of the site. The chalk is at a significant thickness overlying potential coal measures, that works at this site are unlikely to impact Coal Authority Property. The recommended text will be added to the formal application if planning permission is granted and is also included in **paragraph 21.3.37**
Natural England	Natural England recommend that the impact of the proposed development on soils and the best and most versatile agricultural land should be considered with reference to paragraphs 5.13.8 and 5.13.15 National Policy Statement for Ports. It is also recommended that the ES describes the potential disturbance and damage to soils as part of the proposed development. The potential disturbance or loss of agricultural land, including the best and most versatile land, should be considered in the ES. The avoidance and minimisation of potential impact to soils and the best and most versatile agricultural land should be discussed in the ES, including site design, green infrastructure, biodiversity net gain, soil handling and sustainable re-use. Natural England note that an ALC may be required.	The baseline section of the PEI Report provides information on the ALC grading for the site and the soil chemistry in **Paragraphs 21.3.7** to **21.3.11**. The potential impact on soils is discussed in **Paragraphs 21.5.10** to **21.5.13** and summarised in **Table 21.11**. Mitigation measures for soils are summarised in **Section 21.4** including the requirement for an ALC survey prior to the submission of the ES to confirm the subgrades of Grade 3 ALC and inform the ES. Further mitigation measures include the use of a Remediation Strategy to facilitate the potential re-use of soil on site. The National Policy Statement that applies to the Project is the National Policy Statement for Ports which is summarised in **Table 21.5.**
	Natural England also note that the ES should discuss the potential for an increased pollution risk during the construction and	The assessment of significance of effects during the construction and operational phases considers the potential for an increased pollution risk in **Section 21.5.**

Consultee	Summary of Response	How comments have been addressed in this chapter
	operational phases of the proposed development.	
English Heritage	English Heritage have not provided a response to the Scoping Opinion.	No response required.
Immingham Town Council	Immingham Town Council have not provided comments in regard to Ground Conditions and Land Quality.	No response required.
Lincolnshire Council	Lincolnshire Council have not provided a response to the Scoping Opinion.	No response required.
NELC	In terms land quality (Section 20) NELC agree with the scope and methodology presented.	No response required.
Crown Estate	The Crown Estate have not provided a response to the Scoping Opinion.	No response required.
The Port Authority	The Port Authority have not provided a response to the Scoping Opinion.	No response required.
UK Health Security Agency	The UK Health Security Agency note that the potential land quality impacts during the operational phase, including soil impacts, that were scoped out may require further consideration in relation to Chapter 21 Major Accidents and Disasters. It is noted that an incident could be determinantal to land quality as well as the hydrology and neighbouring watercourses.	Operational mitigation measures, including appropriate emergency environmental management plans and procedures, are discussed in **Section 21.4.**

21.2.7 The assessment methodology for the PEI Report follows the methodology proposed in Section 20.6 of the Scoping Report (**Appendix 1.A** of PEI Report Volume IV). There are no changes proposed to the methodology within this PEI Report to that contained in the Scoping Report.

21.2.8 The assessment methodology diverges from the generic guidelines of sensitivity and magnitude of impact outlined in **Chapter 5: EIA Approach** of this PEI Report to follow the guidance in the Design Manual for Roads and Bridges (DMRB) LA 109 Geology and Soils (Ref 21-1) and DMRB LA 113 Road Drainage and the Water Environment (Ref 21-2).

21.2.9 The sensitivity of the receptor reflects the quality of receptor and its ability to absorb an effect without perceptible change. The sensitivity of the receptor is defined using DMRB LA 113 is outlined in **Table 21.2.**

Table 21.2: Sensitivity of Receptors

Sensitivity / Value	Description Criteria	Typical Examples
Very High	Geology Very rare and of international importance with no potential for replacement.	UNESCO World Heritage Sites SSSIs and GCR of international importance and or UNESCO Global Geoparks.
	Soils Soils directly supporting an EU designated site or agricultural land.	SAC, SPA, Ramsar; and/ or ALC Grade 1 and 2 or LCA Grade 1 and 2
	Contamination Human health: very high sensitivity.	Very high sensitivity land use (e.g. residential).
	Surface water Relevant sensitivity criteria from Table 3.70 in Road drainage and water environment LA113.	Watercourse having a WFD classification shown in a RBMP and Q95 ≥ 1. 0 m^3/ s. Site protected/ designated under EC or UK legislation (SAC, SPA, SSSI) Ramsar site, salmonid water/species protected by EC legislation.
	Groundwater Relevant sensitivity criteria from Table 3.70 in Road drainage and water environment LA113.	Principal aquifer providing a regionally important resource and/ or supporting a site protected under EC and UK legislation Groundwater locally supports GWDTE SPZ1
High	Geology Rare and of national importance with little potential for replacement.	Rare and of national importance with little potential for replacement (e.g. geological SSSI, ASSI, National Nature Reserves (NNR)). Geology meeting national designation citation criteria which is not designated as such.
	Soils Soils directly supporting an EU designated site or agricultural land.	Soils directly supporting a UK designated site (e.g. SSSI); and/ or ALC Grade 3a, or LCA Grade 3.1.
	Contamination Human health: very high sensitivity;	High sensitivity land use such as public open space.
	Surface water	Watercourse having a WFD classification shown in a RBMP and Q95 <1.0m^3/ s.

Sensitivity / Value	Description Criteria	Typical Examples
	Relevant sensitivity criteria from Table 3.70 in Road drainage and water environment LA113.	Species protected under EC or UK legislation.
	Groundwater Relevant sensitivity criteria from Table 3.70 in Road drainage and water environment LA113.	Principal aquifer providing locally important resource or supporting a river ecosystem. Groundwater supports a GWDTE. SPZ2.
Medium	Geology Of regional importance with limited potential for replacement. Geology meeting regional designation citation criteria which is not designated as such.	Local Geological Sites (formerly RIGS)
	Soils Soils supporting non-statutory designated sites.	Local Nature Reserves (LNR), LGS's, Sites of Nature Conservation Importance (SNCIs); and/ or ALC Grade 3b or LCA Grade 3.2.
	Contamination Human health: medium sensitivity;	Medium sensitivity land use such as commercial or industrial.
	Surface water Relevant sensitivity criteria from Table 3.70 in Road drainage and water environment LA113.	Watercourses not having a WFD classification shown in a RBMP and Q9 5 >0.001m^3/ s.
	Groundwater Relevant sensitivity criteria from Table 3.70 in Road drainage and water environment LA113.	Aquifer providing water for agricultural or industrial use with limited connection to surface water. SPZ3
Low	Geology Of local importance/ interest with potential for replacement	Non designated geological exposures, former quarry's/ mining sites
	Soils Soils supporting non-designated notable or priority habitats	ALC Grade 4 and 5 or LCA Grade 4.1 to 7

Sensitivity / Value	Description Criteria	Typical Examples
	Contamination Human health: Low sensitivity;	Low sensitivity land use such as highways and rail.
	Surface water Relevant sensitivity criteria from Table 3.70 in Road drainage and water environment LA113.	Watercourses not having a WFD classification shown in a RBMP and Q9 5 ≤0.001m^3/ s.
	Groundwater Relevant sensitivity criteria from Table 3.70 in Road drainage and water environment LA113.	Unproductive strata
Negligible	Geology No geological exposures, little/ no local interest.	
	Soils Previously developed land formerly in 'hard uses' with little potential to return to agriculture.	
	Contamination Human health: Undeveloped surplus land/ no sensitive land use proposed.	
	Surface water and groundwater There is no sensitivity rating for negligible described in LA113.	

21.2.10 The magnitude of a potential impacts considers the scale of the predicted change to the baseline condition taking into account its duration (i.e. the magnitude may be moderated if they are temporary rather than permanent, short term rather than long term). The magnitude of impact is defined using DMRB LA 113 and DMRB LA 100 as outlined in **Table 21.3.**

Table 21.3: Magnitude of Impacts

Magnitude	Criteria	Typical Examples
Major (LA109)	Geology Loss of geological feature/ designation and/ or quality and integrity, severe damage to key characteristics, features or elements.	Destruction of features at a protected site; i.e. SSSIs of international importance; or Global Geoparks.
	Soils Physical removal or permanent sealing of soil resource or agricultural land.	N/A
	Contamination Human Health: significant contamination identified.	Contamination levels significantly exceed background levels and relevant screening criteria (e.g.: category 4 screening levels) SP1010 with potential for significant harm to human health. Contamination heavily restricts future use of land.
Major adverse (LA113)	Surface water: relevant sensitivity criteria from Table 3.71 in Road drainage and water environment LA113.	Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT and compliance failure with EQS values. Calculated risk of pollution from a spillage ≥2% annually (spillage assessment). Loss or extensive change to a fishery. Loss of regionally important public water supply (spillage assessment). Loss or extensive change to a fishery. Loss of regionally important public water supply. Loss or extensive change to a designated nature conservation site. Reduction in water body WFD classification.
	Groundwater: relevant sensitivity criteria from Table 3.71 in Road drainage and water environment LA113.	Loss of, or extensive change to, an aquifer. Loss of regionally important water supply. Potential high risk of pollution to groundwater from routine runoff - risk

Magnitude	Criteria	Typical Examples
		score >250 (Groundwater quality and runoff assessment). Calculated risk of pollution from spillages ≥2% annually (spillage assessment). Loss of, or extensive change to GWDTE or baseflow contribution to protected surface water bodies. Reduction in water body WFD classification. Loss or significant damage to major structures through subsidence or similar effects.
Major Beneficial (LA113)	-	Removal of existing polluting discharge or removing the likelihood of polluting discharges occurring to a watercourse. Improvement in water body WFD classification.
		Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring. Recharge of an aquifer. Improvement in water body WFD classification.
Moderate (LA109)	<u>Geology</u> Partial loss of feature/ designation, potentially adversely affecting integrity; partial loss of/ damage to key characteristics, features or elements.	Partial loss of features at a protected site; i.e. SSSIs; National Nature Reserves.
	<u>Soils</u> permanent loss/ reduction of one or more soil function(s) and restriction to current or approved future use (e.g. through degradation, compaction, erosion of soil resource.)	N/ A
	<u>Contamination</u> Human health: contaminant concentrations exceed background levels and are in line with limits of relevant screening criteria	Significant contamination can be present. Control/ remediation measures are required to reduce risks to human health/ make land suitable for intended use.

Magnitude	Criteria	Typical Examples
	(e.g. category 4 screening levels) SP1010.	
Moderate adverse (LA113)	Surface water: relevant sensitivity criteria from Table 3.71 in Road drainage and water environment LA113.	Failure of both acute-soluble and chronic-sediment related pollutants in HEWRAT but compliance with EQS values. Calculated risk of pollution from spillages ≥1% annually and <2 % annually. Partial loss in productivity of a fishery. Degradation of regionally important public water supply or loss of major commercial/ industrial/ agricultural supplies. Contribution to reduction in water body WFD classification.
	Groundwater: relevant sensitivity criteria from Table 3.71 in Road drainage and water environment LA113.	Partial loss or change to an aquifer. Degradation of regionally important public water supply or loss of significant commercial/ industrial/ agricultural supplies. Potential medium risk of pollution to groundwater from routine runoff - risk score 150-250. Calculated risk of pollution from spillages ≥1% annually and <2 % annually. Partial loss of the integrity of GWDTE. Contribution to reduction in water body WFD classification. Damage to major structures through subsidence or similar effects or loss of minor structures.
Moderate beneficial (LA113)	Surface water: relevant sensitivity criteria from Table 3.71 in Road drainage and water environment LA113.	HEWRAT assessment of both acute-soluble and chronic-sediment related pollutants becomes pass from an existing site where the baseline was a fail condition. Calculated reduction in existing spillage by 50% or more (when existing spillage risk >1% annually). Contribution to improvement in water body WFD classification.

Magnitude	Criteria	Typical Examples
	Groundwater: relevant sensitivity criteria from Table 3.71 in Road drainage and water environment LA113.	Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is >1% annually). Contribution to improvement in water body WFD classification. Improvement in water body catchment abstraction management Strategy (CAMS) (or equivalent) classification. Support to significant improvements in damaged GWDTE.
Minor (LA109)	Geology Minor measurable change in geological feature/ designation attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.	Minor measurable change of features at Geological sites; i.e. RIGS.
	Soils Temporary loss/ reduction of one or more soil function(s) and restriction to current or approved future use.	Through degradation, compaction, erosion of soil resource.
	Contamination Human health: contaminant concentrations are below relevant screening criteria (e.g. category 4 screening levels) SP1010.	Significant contamination is unlikely with a low risk to human health. Best practice measures can be required to minimise risks to human health.
Minor adverse (LA113)	Surface water: relevant sensitivity criteria from Table 3.71 in Road drainage and water environment LA113.	Failure of either acute soluble or chronic sediment related pollutants in HEWRAT. Calculated risk of pollution from spillages ≥0.5% annually and < 1% annually. Minor effects on water supplies.
	Groundwater: relevant sensitivity criteria from Table 3.71 in Road drainage and water environment LA113.	Potential low risk of pollution. to groundwater from routine runoff - risk score <150 Calculated risk of pollution from spillages ≥0.5% annually and <1% annually. Minor effects on an aquifer, GWDTEs, abstractions and structures.
Minor beneficial (LA113)	Surface water: relevant sensitivity criteria from Table 3.71 in Road	HEWRAT assessment of either acute soluble or chronic-sediment related pollutants becomes pass from an existing

Magnitude	Criteria	Typical Examples
	drainage and water environment LA113.	site where the baseline was a fail condition. Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <1% annually).
	Groundwater: relevant sensitivity criteria from Table 3.71 in Road drainage and water environment LA113.	Calculated reduction in existing spillage risk by 50% or more to an aquifer (when existing spillage risk <1% annually). Reduction of groundwater hazards to existing structures. Reductions in waterlogging and groundwater flooding.
Negligible (LA109)	Geology Very minor loss or detrimental alteration to one or more characteristics, features or elements of geological feature/ designation. Overall integrity of resource not affected.	Very minor change of features at sites of local importance, i.e. non-designated geological sites.
	Soils No discernible loss/ reduction of soil function(s) that restrict current or approved future use.	N/A
	Contamination Human health: contaminant concentrations substantially below levels outlined in relevant screening criteria (e.g. category 4 screening levels) SP1010	No requirement for control measures to reduce risks to human health/ make land suitable for intended use.
Negligible (LA113)	Surface water: relevant sensitivity criteria from Table 3.71 in Road drainage and water environment LA113.	No risk identified by HEWRAT (pass both acute-soluble and chronic-sediment related pollutants). Risk of pollution from spillages <0.5%.
	Groundwater: relevant sensitivity criteria from Table 3.71 in Road drainage and water environment LA113.	No measurable impact upon an aquifer and/ or groundwater receptors and risk of pollution from spillages <0.5%.

21.2.11 The significance of effect matrix diverges from the generic significance evaluation matrix provided in **Chapter 5: EIA Approach** to follow the guidance in DMRB LA 104 (Ref 21-3). **Table 21.4** provides a summary of the significance of effect matrix.

Table 21.4.Significance Evaluation Matrix

		Magnitude of Change (degree of change)				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
Sensitivity of Receptor	**Very high**	Neutral	Slight	Moderate or large	Large or very large	Very large
	High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
	Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight
Note: where two significance categories are given, evidence should be provided to support the reporting of a single significance category.						

Legislation, Policy and Guidance

21.2.12 **Table 21.5** presents the legislation, policy and guidance relevant to the Ground Conditions and Land Quality assessment and details how their requirements will be met in the assessment. The North Lincolnshire Plan was previously included in the Scoping Report. However, the Order Limits is not located within the boundary of North Lincolnshire Council (NLC). Therefore, the local plan has not been summarised in **Table 21.5**.

Table 21.5 Relevant legislation, policy and guidance regarding Ground Conditions and Land Quality Chapter

Legislation / Policy / Guidance	Consideration within the PEI Report
EU Legislation Although the UK left the EU on 31 January 2020, the legislation in this section has been adopted by the UK and remains applicable to the assessments in this PEI Report, as summarised in **Chapter 4: Legislative and Consenting Framework**.	
The Water Framework Directive (2000/60/EC) (Ref 21-37)	
The framework for community action in the field of water policy. The principal objective of the WFD is for all groundwater, surface water and coastal water bodies to achieve 'good' status by 2015 and maintain this status. It includes broader ecological objectives as well as aims to prevent deterioration of all water bodies. The WFD aims	The WFD surface water bodies are described in **Paragraphs 21.3.47** and **21.3.48**. The potential impact to the WFD surface water bodies is outlined in **Sections 21.5** and **21.6**.

Legislation / Policy / Guidance	Consideration within the PEI Report
to develop sustainable water use and reduce and eliminate the presence of hazardous substances within water bodies. It must be considered in any scheme that has the potential to have an impact on any part of the water environment. This is transposed into UK law by *The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref 21-38).*	
The Groundwater Directive (2006/118/EC) (Ref 21-39)	
This Directive classifies groundwater bodies, establishes pollutant threshold values, and identifies trends and starting points for their reversal. Specific measures to control groundwater pollution are described, including good groundwater chemical status criteria and provisions to control groundwater pollutant inputs. The Directive provides further details on groundwater pollution control that are outlined within the *Water Framework Directive (2000/60/EC)*. This is transposed into UK law by *The Groundwater (Water Framework Directive) (England) Direction 2016* (Ref 21-40) and *The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017* (Ref 21-38).	The WFD groundwater bodies are described in **Paragraph 21.3.39**. The potential impact to groundwater is outlined in **Sections 21.5** and **21.6**.
The Environmental Liability Directive (2004/35/EC) (Ref 21-41)	
This Directive relates to the prevention and remedying of environmental damage. The Directive refers to environmental damage to habitats and protected species, water damage (chemical and ecological) and land damage caused by land contamination. In this instance, damage is defined as "*a measurable adverse change in a natural resource or measurable impairment of a natural resource service which may occur directly or indirectly*". It also establishes a framework based on the 'polluter pays' principle to prevent and remedy environmental damage. Operators are therefore liable to the cost of prevention measures and remediation strategies. This is transposed into UK law by *The Environmental Damage (Prevention and Remediation) (England) (Amendment) Regulations 2019* (Ref 21-42).	Mitigation measures to prevent environmental damage are discussed in **Section 21.4**.
Classification Labelling & Packaging (CLP) Regulation (2008/1272/EC) (Ref 21-43), superseding *The Dangerous Substances Directive (67/548/EEC)* in 2016	
The Regulation aims to ensure the environment and human health are protected through the classification and labelling of substances. The regulation also aims to ensure free movement of substances and mixtures. This is transposed into UK law by *The Classification, Labelling and Packaging of Chemicals (Amendments to Secondary Legislation) Regulations 2015* (Ref 21-45).	The potential impact to human health and the environment from any substances used on site during the construction, operational and decommissioning phases of the Project are discussed in **Sections 21.5** and **21.6**.The mitigation measures are discussed in **Section 21.4**.

Legislation / Policy / Guidance	Consideration within the PEI Report
The Priority Substances Directive (2008/105/EC) (Ref 21-46)	
The Directive is part of EU legislation and details the environmental quality standards (EQS) for priority substances and other pollutants provided in the WFD. The Directive aims for water bodies to achieve good surface water chemical status. This is transposed into UK law by *The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015* (Ref 21-47).	The WFD surface water bodies are described in **Paragraphs 21.3.47** and **21.3.48**. The WFD groundwater bodies are described in **Paragraph 21.3.39**. The potential impact to the WFD surface water bodies and groundwater bodies are outlined in **Sections 21.5** and **21.6**.
UK Legislation	
Environmental Protection Act, 1990 (Ref 21-48)	
Part 2A of the *Environmental Protection Act 1990* provides a means of dealing with unacceptable risks posed by land contamination to human health and the environment. Enforcing authorities are required to identify and deal with such land.	The potential impacts to human health and the environment are outlined in **Sections 21.5** and **21.6**.
The Environment Act 1995 (Ref 21-49)	
The Act established the Environment Agency (EA) and Scottish Environment Protection Agency (SEPA) as corporate bodies. This makes provision with respect to contaminated land and abandoned mines. Further provisions are provided for National Parks, pollution controls, natural resource conservation and environment conservation/enhancement.	The potential impacts to the environment from the Project are outlined in **Sections 21.5** and **21.6.**
The Environment Act 2021 (Ref 21-50)	
The Act provides a legal framework for environmental governance and for specific improvement of the environment, including measures on waste and resource efficiency, air quality and environmental recall, water, nature and biodiversity, and nature conservation covenants.	Mitigation measures to protect the environment as part of the proposed development are outlined in **Section 21.4**.
The Contaminated Land (England) (Amendment) Regulations 2012 (Ref 21-51)	
The Regulations set out the processes of risk assessment and identification/evaluation of remediation options. This is an amendment of the *Contaminated Land (England) Regulations, 2006 (Ref 21-52)*.	The potential sources, pathways and receptors are outlined in **Paragraphs 21.3.59** to **21.3.61**, and the potential impacts to the receptors are discussed in **Sections 21.5** and **21.6**.
Environmental Damage (Prevention and Remediation) (England) Regulations 2015 (Ref 21-53)	

Legislation / Policy / Guidance	Consideration within the PEI Report
The Regulations describes the legal framework for the prevention of environmental damage and requirements for remediation of damage when it occurs. It sets out the UK Government views on how they should be applied and how particular terms should be interpreted.	Mitigation measures to mitigate and reduce the potential impact to the environment are discussed in **Section 21.4**.
The Water Act 2003 (Ref 21-54)	
The Act provides measures with regards to holding and issuing licenses for water abstractions. The four broad aims of the Act are to ensure sustainable use of water resources, to strengthen the voice of consumers, to increase competition and to promote water conservation. The Act also considers controlled waters pollution and coal mine water discharge and describes provisions for land drainage and flood defence. This was issued to amend the *Water Resources Act 1991* (Ref 21-55) and *Water Industry Act 1991* (Ref 21-56).	Groundwater and surface water abstractions within a 1km radius from the Order Limits are described in **Paragraphs 21.3.45**, **21.3.46** and **21.3.50**.
The Water Act 2014 (Ref 21-57)	
The aim of the Act was to reform the water industry to make it more innovative and responsive to customers and to increase the resilience of water supplies to natural hazards such as droughts and floods. The Act describes provisions for the following: abstraction water license modifications, waterworks records, flood insurance for households, internal drainage boards, regulations for the water environment and Regional Flood and Coastal Committees.	Groundwater and surface water abstractions within a 1km radius from the Order Limits are described in **Paragraphs 21.3.45**, **21.3.46** and **21.3.50**.
The Environmental Permitting (England and Wales) Regulations 2016 (as amended) (Ref 21-58)	
Previously under the Water Resources Act 1991 (Ref 21-55) and now under the *Environmental Permitting (England and Wales) Regulations* *(as amended)* it is an offence for a person to fail to comply with or to contravene an environmental permit. The Act provides a framework for the application of environmental permits as well as receiving, varying, transferring and surrendering permits and compliance / enforcement of permits.	Controlled waters are discussed in **Paragraphs 21.3.38** to **21.3.50**. The potential impacts to controlled waters are discussed in **Sections 21.5** and **21.6**. Mitigation measures for controlled waters are described in **Section 21.4**.
The Land Drainage Act 1991 (as amended) (Ref 21-59)	
The Act sets out the enactments related to Internal Drainage Boards (IDB). The Act details the provisions for facilitating or securing land drainage, powers to modify existing obligations, financial provisions, drainage rates and duties with respect to the environment and recreation.	Information on drainage on the site is provided in **Paragraph 21.3.47**. Potential impacts to the drainage on the site and in the study area is discussed in **Sections 21.5** and **21.6**. Mitigation measures to protect controlled waters, including drainage, are presented in **Section 21.4**.

Legislation / Policy / Guidance	Consideration within the PEI Report
	Further information is also provided in Chapter 18 Water Quality, Coastal Protection, Flood Risk and Drainage.
The Water Environment (Water Framework Directive) Regulations 2017 (Ref 21-38)	
The Water Environment Regulations 2017 aims to implement the WFD and Groundwater Directive.	The WFD surface water and groundwater bodies are discussed in **Paragraphs 21.3.39**, **21.3.47** and **21.3.48**. The potential impact to surface water and groundwater are discussed in **Sections 21.5** and **21.6**.
The Waste (England and Wales) Regulations 2011 (as amended) (Ref 21-60)	
The Regulations set out the measures required for the prevention of, production and management of waste. This describes the purpose of a waste prevention program with waste prevention measures and makes reference to monitoring by appropriate authorities using qualitative or quantitative benchmarks.	The management of waste produced on site is discussed in **Paragraphs 21.4.4** and **21.4.5**.
National Policy	
National Policy Statement for Ports (NPSfP) (Ref 21-61)	
The NPSfP is a framework to address proposals for port development in the UK and associated development (rail and road). This describes the UK Government's conclusions on new port infrastructure in the context of future demand and needs and the current economy. The Project consisting of a liquid bulk import terminal and processing facility in the port is considered to be an NSIP within the ports industry. This Policy Statement contains the following relevant policies: Section 4.7 describes the requirements for an Environmental Impact Assessment and states that "*projects that are subject to the European Environmental Impact Assessment Directive must be accompanied by an Environmental Statement (ES) describing the aspects of the environment likely to be significantly affected by the project*". The effects on human health, water, soil, cultural heritage, material assets, climate, the landscape and flora and fauna should be assessed.	Provides general guidance.
Section 4.11 concerns pollution control and environmental regulations that need to be considered. This describes the requirement for pollution control measures and recommends consultation and contact with the EA to determine potential effects, environmental permits and other consents.	Provides general guidance.

Legislation / Policy / Guidance	Consideration within the PEI Report
Paragraph 4.11.3 notes that the decision-maker should consider the development in the context of the land use as opposed to measures to control processes, discharges and emissions. It is stated that *"the decision-maker should work on the assumption that the relevant pollution control regime, other environmental regulatory regimes, including those on land drainage, water abstraction and biodiversity will be properly applied and enforced by the relevant regulator".*	
Section 4.16 refers to the impact of ports on human health, with direct reference to polluting water and hazardous waste. Paragraph 4.16.2 suggests health impacts should be identified.	The potential impacts on human health and controlled waters are described in **Sections 21.5** and **21.6**.
Section 5.1 refers to the impacts on biodiversity and geological conservation. As part of this, paragraph 5.1.3 describes the adverse impacts including spillages or leakages from cargo handling and storage that could result in water pollution and contamination.	There are no geological conservation sites within the study area, as described in **Paragraph 21.3.21**. The potential adverse impacts on geology and controlled waters are described in **Sections 21.5** and **21.6**.
Section 5.6 refers to water quality and resources. In particular, paragraph 5.6.2 refers to the risk of pollutants entering the water due to spills and leaks from the development.	The risk of pollutants entering the water due to spillages and leakages are described in **Sections 21.5** and **21.6**. Mitigation measures for the proposed development are described in **Section 21.4**.
Section 5.13 refers to land use and in particular, paragraph 5.13.8 describes how the risks associated with land contamination should be considered when land has previously been developed.	The baseline conditions, including potential sources of contamination, are described in **Section 21.3**. The potential impact to the proposed development is described in **Sections 21.5** and **21.6**.
National Planning Policy Framework (NPPF) (Ref 21-62)	
The NPPF sets out the government's planning policies for England and how these are expected to be applied. This Framework contains policies relevant to the geology and soils assessment. Paragraph 120 c) describes how "*planning policies and decisions should give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land*".	Provides general guidance.
Paragraph 174b relates to contributing to and enhancing the local environment through recognising the benefits of natural capital, ecosystem services, agricultural land, trees and woodland.	Provides general guidance.

Legislation / Policy / Guidance	Consideration within the PEI Report
Paragraphs 183 – 188 form part of a section called 'Ground conditions and pollution'.	The baseline in **Section 21.3** outlines the ground conditions at the site and provides information on potential sources of contamination within the study area for the Project.
Paragraph 183 details requirements of planning policies in the context of proposed development on a site including adequate site investigation, suitability in the context of ground conditions, land instability and contamination and proposals for mitigation. This requires that land cannot be classified as contaminated post remediation as defined under Part IIA of the *Environmental Protection Act 1990*.	**Section 21.3** provides the baseline for ground conditions, including reference to land instability and potential sources of contamination. A site investigation is proposed to be undertaken, as described in **Paragraphs 21.2.17, 21.4.3 and 21.4.8**.
Paragraph 184 relates to the responsibility of developers and/or landowners for safe development.	Provides general guidance.
Paragraph 185 refers to minimising the effects of pollution and adverse impacts from the Project.	Mitigation measures for the Project are described in **Section 21.4** and summarised in **paragraphs 21.4.3 to 21.4.14** for the construction phase, **21.4.15 to 21.4.17** for the operational phase and **21.4.18 to 21.4.20** for the decommissioning phase.
Local Policy	
Northeast Lincolnshire Council Local Plan (Ref 21-63)	
The following policies of the NELC Local Plan are relevant to the ground conditions and land quality assessment: Policy 34: Water management. This policy outlines the requirements of development proposals in relation potential impacts to surface and groundwater. Such requirements include sustainable and adequate water supplies on site, efficient water use, adequate foul water treatment and appropriate sewerage systems. The Humber River Basin Management Plan (RBMP) should be considered. The policy also refers to the importance of protecting groundwater within Source Protection Zones (SPZ) during construction and operational phases.	Information on controlled waters is provided in the baseline in **Paragraphs 21.3.38** and **21.3.46**. Mitigation measures to protect controlled waters during the construction, operational and decommissioning phases is provided in **Section 21.4**.
Policy 40: Developing a green infrastructure network. This policy outlines the importance of green spaces and infrastructure within developments, as well as biodiversity, climate change mitigation and sustainable water management. As part of this Policy, open areas between Immingham and the northern industrial development will be given specific protection.	Provides general guidance.
Policy 41: Biodiversity and Geodiversity. This policy aims to retain, protect and restore biodiversity value and the ecological network. The protection and enhancement of	Designated geological sites are described in **Paragraph 21.3.4**. The potential impact to geology and controlled waters, including

Legislation / Policy / Guidance	Consideration within the PEI Report
biological and geological sites are also described within this policy. Specific reference is made to the Estuary Employment Zone which requires management to protect the biodiversity.	the Humber Estuary, are described in **Section 21.5 and 21.6**.
Policy 46: Restoration and Aftercare (minerals). This policy refers to mineral development applications which should minimise disturbance and restore land as early as possible.	Provides general guidance.
Policy 49: Restoration and Aftercare (waste). This policy refers to proposals for additional landfill that should minimise disturbance and restore the land as early as possible.	Provides general guidance.
Guidance	
Ministry of Agriculture, Fisheries and Food (1988): The Agricultural Land Classification of England and Wales: revised guidelines and criteria for grading the quality of agricultural land (Ref 21-64).	
The document provides guidance on the grading of agricultural land as part of the Agricultural Land Classification (ALC). The ALC considers the physical and chemical characteristics of land and potential limitations on agricultural land use. The grading of the land is influenced by climate, gradient, microrelief, flooding, soil properties, presence of stones, chemistry, soil wetness, moisture, and irrigation. The ALC is divided into five grades from 1 to 5, with Grade 3 separated into subgrades 3a and 3b: • Grade 1 is defined as excellent quality agricultural land; • Grade 2 is defined as very good agricultural land; • Grade 3a is defined as good quality agricultural land; • Grade 3b is defined as moderate quality agricultural land; • Grade 4 is defined as poor quality agricultural land; • Grade 5 is defined as very poor-quality agricultural land; and • Grade Urban is defined as built-up land / 'hard' uses such as industrial land, housing, commercial land, education, transport, cemeteries, religious buildings, permanent caravan sites, derelict land and hard-surfaced sports facilities. It is considered that Grade Urban land will be unlikely to return to an agricultural land use.	The ALC for the site is described in **paragraphs 21.3.9** to **21.3.11** and the recommendation for an ALC survey is discussed in **paragraph 21.4.13**.

Legislation / Policy / Guidance	Consideration within the PEI Report
Natural England (2012) Technical Information Note TIN049 Agricultural Land Classification: Protecting the best and most versatile agricultural land (Ref 21-65)	
The Technical Information Note discusses the ALC criteria and guidelines in a shorter format compared to the Ministry of Agriculture, Fisheries and Food (1988) document. The methodology for the ALC field survey is outlined and information regarding consultation with Natural England is summarised.	The ALC for the site is described in **paragraphs 21.3.9** to **21.3.11** and the recommendation for an ALC survey is discussed in **paragraph 21.4.13**.
IEMA Guide: A New Perspective on Land and Soil in Environmental Impact Assessment (Ref 21-66)	
The IEMA guide provides information on the consideration of the effects of proposed developments on soil within EIA including soil function, soil handling during all phases of the proposed development and sustainable soil use of soils.	The soil classification is described in **Paragraph 21.3.7** and the soil chemistry is described in **Paragraph 21.3.8**. The impact on the soil within the site boundary is summarised in **Table 21.11.**

Stakeholder Engagement

21.2.13 A range of stakeholders have been engaged as part of the scoping process to obtain their views on the Project and the scope of the Ground Conditions and Land Quality assessment, the results of which are presented within the Scoping Opinion (**Appendix 1.B** of the PEI Report Volume IV).

Limitations and Assumptions

21.2.14 The information presented in this preliminary assessment reflects that obtained and evaluated at the time of reporting, and is based on an emerging design for the Project and the maximum likely extents of land required for its construction and operation in accordance with the principles of the Rochdale Envelope.

21.2.15 The assessment undertaken during the PEI Report has been based on the collation and evaluation of available information obtained from the British Geological Survey (BGS), Groundsure Report and other sources made available.

21.2.16 Site specific Ground Investigation (GI) information is not yet available for the Project.

21.2.17 Prior to the development of the ES, a GI will be undertaken to assess the presence of contamination on site and determine the impacts this may have on site users and the environment. The findings will feed into the identification of mitigation measures, which may include remediation, the detailed design process and Construction Environmental Management Plan (CEMP) of the Project so that appropriate measures are taken.

21.2.18 If, during development, any previously unidentified contamination is encountered, an appropriate investigation to allow sampling and testing of materials and risk assessment will be undertaken. Any actions resulting from the risk assessment will be agreed with the local planning authority along with any remedial measures in consultation with the EA, where risks to controlled waters are identified. Any

remedial measures will be outlined within a Remediation Strategy developed in parallel with the ES and CEMP which will be submitted for DCO examination.

21.2.19 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further through the assessment and consultation processes, and as further research and investigative surveys are completed to fully understand its potential effects.

21.2.20 The findings from further investigation will be used to re-evaluate the assessment of ground conditions and land quality within the ES.

Study Area

21.2.21 The study area for the assessment is defined as the area over which potential direct and indirect effects of the Project are predicted to occur during the construction and operational periods.

21.2.22 Direct effects on ground conditions are considered to be those that may arise through the accidental release of contaminants during construction and / or operation.

21.2.23 Indirect effects are considered to involve the disturbance of the ground in such a way that contaminant linkages (source-pathway-receptor) are created. For example, hypothetically introducing a new pathway for the migration of a pollution plume within the Made Ground into aquifers or by allowing potentially contaminated dusts, during construction, to migrate offsite to nearby residential and/or commercial properties.

21.2.24 As stated in the Scoping Report (**Appendix 1.A** of the PEI Report Volume IV), the study area for the ground conditions and land quality topic is defined as the entirety of the ground within the Project Site boundary, along with a buffer extending 500m around the Site in order to identify potential off-site source of contamination and land stability issues to inform the baseline conditions within and adjacent to the Site. This includes the artificial land, geological deposits underlying artificial ground and any natural ground underlying surface water bodies within the area of the Site. For assessment of effects to controlled waters including groundwater abstractions and groundwater source protection zones a buffer extending 1 km from the Site boundary is considered appropriate. The Site location is shown on **Figure 1.1** and **Figure 2.1** (PEI Report Volume III) shows the indicative site plan for the Project, outlining the location of the West Site, Pipeline, East Site, Temporary Construction Area and Jetty areas of the Site.

21.3 Baseline Conditions

Current Baseline

21.3.1 The baseline conditions established for this assessment are based on a review of a wide range of data and information from published material from the following sources:

a. BGS GeoIndex Online (Ref 21-1);

b. British Geological Survey Solid and Drift for Partington (Sheet 81 (and including parts of Sheet 82 and 90) 1:50,000 (Ref 21-5);

c. British Geological Survey Lexicon of Named Rock Units (Ref 21-6, Ref 21-7, Ref 21-8 and Ref 21-9);

d. Cranfield Soil and Agrifood Institute Soilscapes (Ref 21-10);

e. Coal Authority Interactive Map Viewer (Ref 21-11);

f. Defra's MAGIC website (Ref 21-12);

g. Environment Agency Catchment Data Explorer (Ref 21-13);

h. Google Maps website (Ref 21-14); and

i. Groundsure Report Enviro+Geo Insight Report (GS-9009838) (Ref 21-15).

21.3.2 The following baseline conditions comprises a summary of the entire Project site using information from the sources listed in **Paragraph 21.3.1**.

21.3.3 Previous GI has been undertaken at the Site within the West Site and the southern area of the East Site. Additional intrusive investigations at the Site are proposed to be undertaken to inform detailed design and will also be used to support the assessment within the ES. Following the completion of the GI works, the baseline description will be updated, and the assessment of ground conditions and land quality will be completed as part of the ES. The objective of the GI will be to obtain sufficient chemical and geotechnical data, via site and laboratory testing, from across the site to be able to further develop a Conceptual Site Model (CSM) and that there is adequate, good quality data available for undertaking human health, controlled waters and ground gas risk assessments.

Statutory and Non-Statutory Designed Sites

21.3.4 The Humber Estuary is designated as a Ramsar site; a Site of Special Scientific Interest (SSSI); a Special Area of Conservation (SAC) and a Special Protection Area (SPA).

21.3.5 The Groundsure Report (GS-9009838) (Ref 21-15) indicates the green hydrogen production facility infrastructure of the Project site is located within a SSSI Impact Risk Zone and the bank of the Humber Estuary within the site boundary is classified as 'unfavourable – recovering'.

21.3.6 The green hydrogen production facility infrastructure of the site is within a Nitrate Vulnerable Zone associated with the North Beck Drain, as shown on **Figure 21.3** (PEI Report Volume III).

Soils

21.3.7 Cranfield Soilscapes (Ref 21-10) describes the soils beneath the entire Site as "*loamy and clayey soils of coastal flats with naturally high groundwater*", with naturally wet drainage and lime rich to moderate fertility. It is noted that the "*water resource is vulnerable to pollution from nutrients, pesticides and wastes applied to the land*".

21.3.8 The BGS Estimated Background Soil Chemistry for the entire Site is recorded as the following in the Groundsure Report (GS-9009838) (Ref 21-15):

a. Arsenic 15-25mg/kg;
b. Lead 100mg/kg;
c. Cadmium 1.8mg/kg;
d. Chromium 90-120mg/kg; and
e. Nickel 30-45mg/kg.

East Site – Agricultural Land Classification

21.3.9 The Provisional Agricultural Land Classification Grade map on the MAGIC Map Application (Ref 21-17) indicates the East Site is designated as Grade Urban.

West Site – Agricultural Land Classification

21.1.2 The Provisional Agricultural Land Classification Grade map on the MAGIC Map Application (Ref 21-17) indicates that most of the West Site is designated as Grade 3. The land has not been subdivided into Grades 3a or 3b. A small area of land parallel to and including the properties on Queens Road is designated as Grade Urban.

Pipeline– Agricultural Land Classification

21.3.10 The Provisional Agricultural Land Classification Grade map on the MAGIC Map Application (Ref 21-17) indicates the Pipeline land is designated as Grade Urban.

Temporary Construction Area (northeast) – Agricultural Land Classification

21.3.11 The Provisional Agricultural Land Classification Grade map on the MAGIC Map Application (Ref 21-17) indicates the eastern half of the Temporary Construction Area is designated as Grade 3, but not subdivided into Grades 3a or 3b, and the western half is designated as Grade Urban.

Geology

21.3.12 The geology beneath the Site is shown on the BGS GeoIndex (Onshore) Map (Ref 21-1), BGS 1;50,000 Sheet 81 (and including parts of Sheets 82 and 90) (Partington) (Ref 21-5) and on the 1:50,000 Geology Maps provided as part of the Groundsure Report (GS-9009838) (Ref 21-15).

21.3.13 **Table 21.6** provides a detailed summary of the anticipated geology beneath the Site and a summary of the description provided on the BGS Lexicon of Named Rock Units (Ref 21-6, Ref 21-7, Ref 21-8 and Ref 21-9). **Figures 21.1** and **21.2** (PEI Report Volume III) demonstrate the geology beneath the Site.

Table 21.6: Geology

Stratum		Expected Location	Description (BGS Lexicon)
Artificial	Made Ground (Undivided) Artificial Deposit	Made Ground (Undivided) is shown on the BGS GeoIndex in the western half of the East Site and in the central area of the Pipeline route. Although it is not mapped across most of the Site, Made Ground is anticipated to be present across the majority of the green hydrogen production facility of the Site.	Made Ground is described as "*an area where the pre-existing (natural or artificial) land surface is raised by artificial deposits. The purpose of the made ground is unspecified. Variable composition*".
Superficial Deposits	Beach and Tidal Flat Deposits (Clay, Silt and Sand)	Northeastern boundary of the green hydrogen production facility (Pipeline and Temporary Construction Area in the northeast) of the Site, along the bank of the Humber Estuary.	Beach and Tidal Flat Deposits are described as "*composite of 'Beach deposits': Shingle, sand, silt and clay; may be bedded or chaotic; beach deposits may be in the form of dunes, sheets or banks, and 'Tidal Flat Deposits': commonly silt and clay with sand and gravel layers; possible peat layers; from the tidal zone*".
	Tidal Flat Deposits (Clay and Silt)	Entire Site, apart from the bank of the Humber Estuary.	Tidal Flat Deposits are described as "*unconsolidated sediment, mainly mud and/or sand. They may form the top surface of a deltaic deposit. Normally a consolidated soft silty clay, with layers of sand, gravel and peat*".
	Devensian Till (Diamicton)	Entire Site, underlying the Tidal Flat Deposits.	There is no description on the BGS Lexicon of Named Rock Units. Till usually comprises clay, sand, gravel and boulders.
Bedrock	Flamborough Chalk Formation	The BGS GeoIndex (BGS, 2022) indicates the Flamborough Chalk Formation is present beneath the entire Site, underlying the Devensian Till. However, the BGS Sheet 81 for Patrington 1:50,000 Map (BGS, 1991) indicates that the Flamborough Chalk Formation is present	The Flamborough Chalk Formation is described as "*White, well-bedded, flint-free chalk with common marl seams (typically about one per metre). Common stylolitic surfaces and pyrite nodules*".

Stratum		Expected Location	Description (BGS Lexicon)
		across most of the Site, apart from a thin strip along the western boundary of the West Site.	
	Burnham Chalk Formation	The Burnham Chalk Formation underlies the Flamborough Chalk Formation across the entire site and underlies the western boundary of the West Site.	The Burnham Chalk Formation is described as "*white, thinly-bedded chalk with common tabular and discontinuous flint bands; sporadic marl seams*".

21.3.14 The Groundsure Report (GS-9009838) (Ref 21-15) indicates the minimum permeability of the superficial deposits is very low, and the maximum permeability varies between low and moderate. The moderate permeability may be associated with the Beach and Tidal Flat Deposits, although this has not been confirmed. The pattern of groundwater flow in the superficial deposits is recorded as intergranular. The minimum and maximum permeability of the chalk bedrock is designated as very high, and the groundwater flow pattern is recorded as being via fractures which is commonly considered to result from the presence of a network of interconnected joints and fissures in the chalk strata.

21.3.15 There are seventeen BGS boreholes located within the Site boundary, or within 5m of the Site boundary. Of the seventeen boreholes, fourteen had accessible borehole records: TA11SE152, TA11SE151, TA21SW278, TA21SW91, TA21NW16, TA21NW18, TA21NW17, TA21NW20, TA21NW3/C, TA21NW3/A, TA21NW3/D, TA21SW338, TA11SE32 and TA21SW92. A summary of the geology encountered is provided in **Table 21.7**.

Table 21.7: Summary of encountered strata in BGS boreholes

Strata	Minimum Depth (m bgl)	Maximum Depth (m bgl)	Thickness Range (m)	Groundwater
West Site				
Soil	0.0	0.3	0.3	-
Clay	0.0	15.24	1.5**– 6.5**	-
Warp	0.3	6.4	4.88 – 6.1	-
Peat	2.9	7.62	0.1 – 1.22	-
Silt	7.62	15.09	0.15 – 0.61	-
Gravel	5.18	5.79	0.61*	-

Strata	Minimum Depth (m bgl)	Maximum Depth (m bgl)	Thickness Range (m)	Groundwater
Boulder Clay	7.77	18	2.89 – 7.17	-
Sand	10.97	11.58	0.61*	-
Chalk***	15.24	25.3**	3.28** – 4.88**	-
Pipeline Area				
Soil	0	1.6	1.3 – 1.6	-
Silt	0	7.92	2.75*	-
Warp	0	9.14	7.16 – 9.14	-
Clay	1.3	19.6	10.37 – 18.3	A water strike was recorded at 16.5m bgl in TA21NW17.
Peat	7.16	7.92	0.46 – 0.6	-
Marl	7.62	20.42	12.8*	-
Clay and Marl	20.42	27.43	7.01	-
Clay and Silt	16.8	18.6	1.8*	-
Gravel	17.1	22.6	3 – 4.3	A water strike was recorded at 18.6m bgl in TA21NW17.
Chalk***	16.46	32.6**	4.9** – 10.8**	-
East Site				
Warp	0	9.14	8.84 – 9.14	The rest level of groundwater was recorded at the ground surface in TA21NW3/D.
Silt	0	10.96**	0.42 – 8.06	-
Sand	8.06	18.59	0.05 – 0.61	-
Peat	8.84	9.83	0.09 – 0.61	-
Clay	9.14	20.12	1.22 – 10.37	-
Chalk***	19.51	33.83	10.97** - 13.71**	-
Northeast Temporary Construction Area*				

Strata	Minimum Depth (m bgl)	Maximum Depth (m bgl)	Thickness Range (m)	Groundwater
Warp	0	8.84	8.84	-
Peat	8.84	9.14	0.3	-
Boulder Clay	9.14	18.9	1.53 – 7.62	-
Sand	16.76	17.37	0.61	-
Gravel	18.9	21.03	2.13	-
Clay	21.03	25.3	4.27	-
Chalk	25.3	31.4**	6.1**	-

**Only encountered in one borehole*
***Depth to base not proven*
****The handwriting on the borehole logs was not clear for Chalk stratum. The handwriting may allude to 'Chalk Bearings' which are referred to in the BGS Chalk Aquifer System of Lincolnshire Research Report (Ref 21-36), however, this is not clear. This summary has been included within Chalk.*
*****The borehole log only stated 'Bd'. The strata cannot be determined but is likely to relate to boulder clay based on the published geological maps and nearby boreholes.*

Ground Stability Hazards

21.3.16 The Groundsure Report (GS-9009838) (Ref 21-15) presents information of the ground stability hazards at the Site.

21.3.17 The Tidal Flat Deposits on the Site are associated with a *Low* shrink swell clay ground stability hazard. The Beach and Tidal Flat Deposits on the banks of the Humber Estuary within the Site boundary are associated with a *Very Low* shrink swell clay ground stability hazard.

21.3.18 The areas of the Site that are mapped as Made Ground on the BGS 1:50,000 Artificial Map are associated with a *Very Low* running sands and compressible ground stability hazards, and the remaining areas of the Site are classified as a *Moderate* hazard.

21.3.19 The entire Site has been classified as a *Negligible* risk for collapsible ground stability hazards and ground dissolution hazards.

21.3.20 The entire Site has been classified as a *Very Low* risk associated with landslide ground stability hazards.

Geological Features

21.3.21 There are no faults within the Site, or within 1km from the Site. There are no Regionally Important Geological Sites (RIGS) or Local Geological Sites within the Site boundary.

Previous Ground Investigations – Pipeline area

21.3.22 A GI was undertaken in the Pipeline area in November 2020 by RSK (Ref 21-19). At the time of the site investigation, the Project was anticipated to comprise of a cold fridge store, two-storey modular office unit, heavy goods vehicle (HGV) parking facilities, dock levellers and a services compound.

21.3.23 The investigation comprised seven boreholes between 5m bgl and 30.45m bgl and twelve trial pits between 2.6m bgl and 4m bgl. Six rounds of groundwater and ground gas monitoring were undertaken as part of the investigation between November and December 2020. Chemical and geotechnical laboratory analysis was also undertaken.

21.3.24 The following strata was encountered:

a. Topsoil at ground level, with a thickness of 0.1m;

b. Made Ground at ground level, with a thickness of 0.1m to 2.4m. The Made Ground deposits were described as "*soft slightly sandy gravelly clays with occasional to frequent cobbles"*. However, it is also noted that pockets or discrete bands of granular "*clayey slightly cobble or slightly sandy gravels"* were also encountered. Anthropogenic material recorded in Made Ground included metal, asphalt, rebar, ash, timber, wood, concrete, brick and boulders of reinforced concrete which may be associated with former foundations or pile caps;

c. Tidal Flat Deposits with a thickness of 7.95m to 8.3m. The depth to the top of the Tidal Flat Deposits was recorded between 0.1m bgl and 2.4m bgl. The Tidal Flat Deposits were described as "*soft or soft to firm grey and grey brown clay*" underlain by '*very soft dark blueish grey silty clays, generally with a frequent organic odour and some organic content'.* It is noted that the Tidal Flat Deposits become very soft from approximately 9m bgl. Small bands of dry peat were encountered between 9.5m bgl and 9.75m bgl, and 10m bgl and 10.45m bgl in BH01;

d. Glacial Till with a thickness of 11.3m to 14.05m. The depth to the top of Glacial Till was record between 9.45m bgl and 10.7m bgl. The Glacial Till was described as "*firm slightly sandy slightly gravelly slightly silty clays which became stiff with depth*". The gravel comprised of flint gravel, fine to medium chalk and occasional coarse chalk. BH01 recorded a grey and buff silty with flint and chalk gravel overlying the chalk bedrock; and

e. Flamborough Chalk Formation with a proven thickness between 0.5m and 1.5m for Grade Dm and a proven thickness of 5m to 7.95m for Grade Dc. Chalk is classified based on the engineering behaviour using the classification system defined in CIRIA C574 'Engineering in Chalk' (CIRIA 2002). Grade Dm chalk is defined as comminuted chalk where "*the material will behave as a cohesive fine soil*" (CIRIA, 2002). Grade Dc chalk is described as "*where clasts (intact chalk lumps) dominate*", resulting in the material behaving as "*a granular, coarse soil*" (CIRIA, 2002). The depth to the top of the Flamborough Chalk Formation was recorded between 22m bgl to 23.5m bgl for Grade Dm and 22.5m bgl to 25m bgl for Grade Dc. The depth to the base of the chalk was not proven. Grade Dm chalk was

described as "*a cream and white slightly sandy slightly gravelly silt*" with weak gravel that had orangish brown weathering. The Grade Dc chalk was described as "*white and occasionally cream silty gravel and cobbles of weak chalk, with some white and occasionally creamish grey silty matrix*" with speckled gravel and cobbles with some orange, brown staining.

21.3.25 The Phase 2 report noted that there were generally no signs of soil contamination across the Site. Hydrocarbon odours were noted between 1.7m bgl and 2.4m bgl within Made Ground in BH01. Organic odours were observed within Made Ground and Tidal Flat Deposits, and an occasional sulphurous odour was noted within Tidal Flat Deposits. No asbestos containing materials were encountered across the Site.

21.3.26 Perched groundwater was encountered at the base of Made Ground deposits. Groundwater strikes were recorded between 16m bgl and 18.3m bgl in two boreholes, rising to between 12m bgl and 14.9m bgl after 20 minutes. Groundwater seepages were recorded between 1.7m bgl and 4m bgl. A summary is provided in **Table 21.8.**

Table 21.8: Summary of groundwater strikes and seepages in the 2020 GI of the Pipeline area

Exploratory Hole	Depth	Strata
Groundwater Strikes		
BH01	16m bgl (initial strike) 12m bgl (after 20 minutes) 3.5m bgl (borehole completion)	Sand and Gravel within the Glacial Till at 16m bgl. Blowing sands were recorded at this depth.
BH02	18.3m bgl (initial strike) 14.9m bgl (after 20 minutes) 2.8m bgl (borehole completion)	Firm slightly gravelly silty clay within the Glacial Till at 18.3m bgl.
Groundwater Seepages		
WS01	3m bgl	Firm slightly gravelly silty clay within the Tidal Flat Deposits.
WS02	2m bgl	Firm slightly silty clay with the Tidal Flat Deposits.
WS04	3.5m bgl	Firm slightly gravelly silty clay within the Tidal Flat Deposits.
WS05	2m bgl	Soft slightly gravelly slightly silty clay within the Tidal Flat Deposits. Noted as very soft and wet material at 2m bgl.
CBR02	3.4m bgl (trial pit terminated)	Very soft slightly gravelly slightly sandy silty clay within the Tidal Flat Deposits.
CBR03	1.7m bgl	Sandy angular to subangular fine to coarse gravel within Made Ground.
CBR04	3.6m bgl (trial pit terminated)	Firm silty clay within the Tidal Flat Deposits.
CBR05	3.2m bgl (trial pit terminated)	Very soft occasionally mottled silty clay within the Tidal Flat Deposits.
CBR06	3.2m bgl (trial pit terminated)	Firm and slightly friable mottled slightly gravelly silty clay within the Tidal Flat Deposits.
CBR07	3.5m bgl (trial pit terminated)	Firm grey silty clay within the Tidal Flat Deposits.
CBR08	3.8m bgl (trial pit terminated)	Soft to firm grey silty clay within the Tidal Flat Deposits.

Exploratory Hole	Depth	Strata
CBR09	3.2m bgl (trial pit terminated)	Soft to firm grey silty clay within the Tidal Flat Deposits.
TP01	2.6m bgl (trial pit terminated)	Firm grey silty clay within the Tidal Flat Deposits.
TP02	4m bgl (trial pit terminated)	Soft to firm grey silty clay within the Tidal Flat Deposits

21.3.27 The depth to water was recorded as dry to 1.65m bgl within the Made Ground response zone. The monitoring wells with a response zone within the Flamborough Chalk Formation recorded depth to water between 1.53m bgl and 3.29m bgl.

21.3.28 The asbestos screening identified asbestos containing material in two out of six samples. Chrysotile loose fibres (<0.001% w/w) were detected in samples of Made Ground at 0.3m bgl and 0.5m bgl in WS05 and TP01, respectively. However, this is associated with past industrial use, and it is not considered to present a significant risk. An outline of a Remediation Strategy will be prepared to define any mitigation measures for potential significant / unacceptable contamination risks at the Site as discussed in **paragraph 21.4.4**. If further asbestos or asbestos containing materials are encountered at the Site and the risk requires mitigation, an Asbestos Management Plan will be prepared as discussed in **paragraph 21.4.7**.

21.3.29 Exceedances of Drinking Water Standards (DWS) for nickel and selenium were recorded in two groundwater samples within two boreholes (BH01 and BH02). The exceedances were of the same order of magnitude as the DWS. There were no exceedances of nickel and selenium recorded in soil samples of Made Ground and Tidal Flat Deposits.

21.3.30 Exceedances of the GAC for coastal surface waters for nickel and zinc were recorded in two samples of groundwater within two boreholes (BH01 and BH02).

21.3.31 The results of the ground gas monitoring indicated the Site is classified as CS2 due to the concentrations of methane (7.6% and 11.4% within BH02).

21.3.32 The Waste Acceptance Criteria (WAC) results indicated that the waste would require treatment and re-testing before disposal at a hazardous landfill.

21.3.33 Running sands were encountered within Glacial Till between depths of 16m bgl and 19m bgl.

21.3.34 Ten California Bearing Ratio (CBR) in situ tests were undertaken at the Site within Made Ground and Tidal Flat Deposits. Nine tests were completed on Made Ground samples. Of the nine tests completed, five were completed on Made Ground clay samples which had a minimum CBR value determined at or below anticipated formation level between 5.7% and 19%. Four tests were completed on Made Ground gravel samples which had a minimum CBR value determined at or below anticipated formation level between 2% and 13%. One test was completed within borehole CBR05 on Tidal Flat Deposits which had a minimum

CBR value determined at or below anticipated formation level of 3.6%. It is recommended that the sub-grade condition at the time of construction should be confirmed and tested at the final formation level. The results indicate that sub-grade soils are frost susceptible

21.3.35 Ten samples were tested to determine the BRE Sulphate Classification (Ref 21-19). For the purposes of the assessment, the Site was classified as brownfield ground likely to contain pyrite. The BRE test results were recorded as follows:

a. Design Sulphate (DS) class DS-1 and AC Class AC-1 for water soluble sulphate in Made Ground;

b. DS class DS-2 and AC Class AC-2 for total potential sulphate in Made Ground;

c. DS class DS-2 and AC Class AC-2 for water soluble sulphate in Tidal Flat Deposits;

d. DS class DS-5 and AC class AC-5 for total potential sulphate in Tidal Flat Deposits; and

e. Overall, the DS class is recommended as DS-2 and the ACEC classification is recommended as AC-2.

21.3.36 The Phase 2 report concludes that the contaminant linkages are absent in regard to human health and controlled waters receptors. The report also notes that the Made Ground and Tidal Flat Deposits are of a variable nature and are highly compressible and of low strength. Therefore, spread foundations or ground floor slabs will not be a suitable foundation option within Made Ground and Tidal Flat Deposits.

Coal Mining

21.3.37 The Coal Authority Interactive Viewer (Ref 21-11) indicates the green hydrogen production facility of the Site is not within a Coal Mining Reporting Area and is not within a Development High Risk Area. The Humber Estuary, including the proposed jetty area, is designated as a Coal Mining Reporting Area. The proposed development lies within a coal mining area which may contain unrecorded coal mining related hazards. If any coal mining feature is encountered during development, this should be reported immediately to the Coal Authority on 0345 762 6848.

Hydrogeology

21.3.38 A summary of the hydrogeological conditions for the Site are provided in **Table 21.9**.

Table 21.9: Aquifer Designations

Strata	Designation	Definition (Ref 21-20)
Beach and Tidal Flat Deposits	Secondary (Undifferentiated)	The EA describe Secondary (Undifferentiated Aquifers) as *"aquifers where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value".*
Tidal Flat Deposits	Unproductive Aquifer	The EA describe Unproductive Aquifers as "*largely unable to provide usable water supplies and are unlikely to have surface water and wetland ecosystems dependent on them".*
Flamborough Chalk Formation	Principal	The EA describe Principal Aquifers as aquifers that *"provide significant quantities of drinking water, and water for business needs. They may also support rivers, lakes and wetlands".*

21.3.39 The Groundsure Report (GS-9009838) (Ref 21-15) indicates that the North Lincolnshire Chalk Unit (a WFD groundwater body) is located on the Site. The overall rating, chemical rating and quantitative rating (dated to 2019) are described as 'poor'.

21.3.40 There are no Drinking Water Protected Areas (Surface Water) or Drinking Water Safeguard Zones (Groundwater) within the Site.

21.3.41 The groundwater vulnerability map on Defra's MAGIC Maps (Ref 21-12) and in the Groundsure Report (GS-9009838) (Ref 21-15) indicates that the West Site, and most of the Pipeline and East Site have a *Low* groundwater vulnerability. The EA (Ref 21-21) describe a *Low* groundwater vulnerability is described as "*areas that provide the greatest protection to groundwater from pollution. They are likely to be characterised by low leaching soils and/or the presence of low permeability superficial deposits*". The *Low* classification is derived from the combination of a productive bedrock aquifer and an unproductive superficial aquifer.

21.3.42 The northeast Temporary Construction Area, and the northeast area of the East Site and Pipeline area are designated as a *Medium – High* groundwater vulnerability on Defra's MAGIC Maps (Ref 21-12) and as a *High* vulnerability in the Groundsure Report (GS-9009838) (Ref 21-15). The EA (Ref 21-21) describes a *Medium* groundwater vulnerability as "*areas that offer some groundwater protection. Intermediate between high and low vulnerability*" and a *High* groundwater vulnerability as "*areas able to easily transmit pollution to groundwater. They are characterised by high leaching soils and the absence of low permeability superficial deposits*". The high vulnerability is derived from the combination of a productive superficial (Secondary Undifferentiated Aquifer within the Beach and Tidal Flat Deposits) and a productive bedrock aquifer (Principal Aquifer within the Flamborough Chalk Formation). The high vulnerability is also related to the combination of a productive bedrock aquifer (Principal Aquifer within the Flamborough Chalk Formation) and an unproductive superficial aquifer

(Tidal Flat Deposits) in the remaining areas of the northeast Temporary Construction Area which are underlain by Tidal Flat Deposits and in turn Devensian Till deposits.

21.3.43 SPZs are located on the entire Site, as shown in Figure 21.6 (PEI Report Volume III). An SPZ 1 (Inner Catchment) is located in the southern half of the Site within the proposed pipeline route and West Site, near Queens Road. The EA (Ref 21-22) describe an SPZ 1 as a "*50 day travel time of pollutant to source with a 50 metres default minimum radius*". An SPZ 2 (Outer Catchment) radiates out from the SPZ 1 towards the south, and encompasses the southern half of the Site, including the West Site, and further north within the proposed pipeline route. The EA (Ref 21-22) describe an SPZ 2 as a "*400 day travel time of pollutant to source. This has a 250 or 500 metres minimum radius around the source depending on the amount of water taken*". An SPZ 3 (Total Catchment) is located around the SPZ 2, and encompasses the remainder of the Site, including the proposed pipeline route, East Site and northeast Temporary Construction Area. The EA (Ref 21-22) describe an SPZ 3 as "*the area around a supply source within which all the groundwater ends up at the abstraction point. This is the point from where the water is taken. This could extend some distance from the source point*". The SPZ is likely associated with an abstraction within the Flamborough Chalk Formation due to the designation as a Principal Aquifer, although this information has not been confirmed. The Chalk is overlain and confined by a considerable thickness of superficial strata which are themselves not productive aquifers.

21.3.44 An SPZ 2c (Outer Catchment within a Confined Aquifer) is also located on the Site, within the northern corner of the West Site. It is noted in the Groundsure Report (GS-9009838) (Ref 21-15) that a "*confined aquifer would normally be protected from contamination by overlying geology and is only considered a sensitive resource if deep excavation/drilling is taking place*". The SPZ 2c is likely to be associated with the Flamborough Chalk Formation.

21.3.45 There are no groundwater abstractions located within the Site boundary. The closest groundwater abstraction is located as 27m northwest from the West Site associated with an historical raw water supply abstraction. An active groundwater abstraction is located approximately 37m northwest from the West Site, associated with raw water supply. These groundwater abstractions are associated with the SPZ 1 within the Site boundary.

21.3.46 In the wider area, there are a further eight groundwater abstractions within 1km of the Site. Of the nine groundwater abstractions, three are considered to be active and six are considered to be historical abstractions.

Surface Waters

21.3.47 The EA Catchment Data Explorer (Ref 21-13) and the Groundsure Report (GS-9009838) (Ref 21-15) indicates the entire Site is located within the catchment for the North Beck Drain water body. The ecological classification (dated to 2019) is defined as 'moderate'. The chemical classification (dated to 2019) is defined as 'fail' for priority hazardous substances Mercury and its Compounds and Polybrominated Diphenyl Ethers (PDBE). The water body is also described as

'heavily modified'. The North Beck Drain is located immediately adjacent to the eastern Site boundary in the north of the Site, near to the proposed pipeline route. The Habrough Marsh Drain is part of the North Beck Drain catchment and is located to the west of the Site.

21.3.48 The marine side of the Site is also located within the Humber Lower Transitional Water Body. The ecological classification (dated to 2019) is defined as 'moderate' and the chemical classification (dated to 2019) is defined as 'fail' for priority hazardous substances Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Mercury and its compounds, Perfluoro octane Sulphonate (PFOS), PDBE and Tributyltin Compounds. The 'fail' classification is also associated with priority substances Cypermethrin (Priority hazardous) and Dichlorvos (Priority). The Humber Lower Transitional Water Body is also described as heavily modified.

21.3.49 There are approximately forty-four Ordnance Survey (OS) Water Network Lines located on the Site, comprising unidentified inland rivers on the ground surface and underground that are not influenced by normal tidal action. The OS Water Network Lines map is not clear. However, it indicates that water lines are located within all sub sites. There are a further twenty-eight OS Water Network Lines within 50m of the Site boundary, and forty-nine between 250m and 500m from the Site boundary.

21.3.50 There are no licensed surface water abstractions within the Site boundary or within 1km from the Site.

Historical Development

21.3.51 A summary of the historical development within the Site boundary and within the 500m study area is provided in **Table 21.10**.

Table 21.10: Summary of historical development within the Site and the study area

Date and Scale	Significant Features Onsite	Significant Features Off-Site (within 500m radius)
1886 – 1888 (1:2,500 and 1:10,560)	• Agricultural fields in all areas of the Site. • 'North Beck Drain' is denoted within the northeast Temporary Construction Area. • A surface water feature and a forested area identified as 'Long Strip' (a forested area) are shown in the Pipeline area. • 'Beacons' are denoted in the Pipeline area.	• Agricultural fields in all areas of the Site. • 'North Beck Drain' is denoted approximately 345m southeast from the West Site area. • 'Springs' are denoted at 'Habrough Marsh' approximately 185m west from the Pipeline route, approximately 360m south and 400m southeast from the West Site. • A water feature flowing northeast is shown immediately west from the Pipeline area and East Site. • A 'Sluice' is denoted approximately 225m north from the East Site. • A 'Pump' is shown approximately 105m east from the northeast Temporary

Date and Scale	Significant Features Onsite	Significant Features Off-Site (within 500m radius)
		Construction Area, associated with the 'Ship Inn' and 'Stallingborough Light' and approximately 320m east from the Site associated with the 'Coastguard Station'.
1905 – 1906 (1:10,560)	• Two 'Springs' are shown in West Site area and two 'Springs' are shown within the Pipeline area.	• Multiple 'Springs' are denoted within a 1km radius from the Site. • A 'Well' is denoted at 'Habrough Marsh' west of the Pipeline route. • The pumps at the 'Ship Inn' and 'Coastguard Station' to the east of the northeast Temporary Construction Area are no longer shown.
1907 (1:2,500)	• Water features, assumed to be drains, are shown through the Pipeline area.	• A small pond or lake is denoted within the centre of the Pipeline area.
1910 (1:10,560)	• No significant changes.	• Further 'Springs' are denoted within 1km west from the Site.
1930 - 1931 (1:10,560)	• Residential housing is shown adjacent to 'Queens Road' in the West Site. • 'L.N.E.R. Grimsby District Electric Light Railway' is shown through the centre of the Pipeline route Site (area of the proposed pipeline route) orientated northeast to southwest and northwest to southeast. Embankments are denoted either side of the railway. • A 'Shelter' is denoted in the centre of the Pipeline area.	• Railway sidings are denoted approximately 80m north from the West Site. • A 'Signal Box', 'Engine Shed' and 'Store' are shown between approximately 130m and 560m northwest from the West Site. • A 'Sewage Works' is denoted approximately 60m east from the Pipeline area. • An 'Allotment Garden' is shown adjacent to the northern boundary of the West Site. • A 'Methodist Church' and a 'Club' are denoted approximately 500m west from the West Site. • The 'Ship Inn', 'Stallingborough Light' and the 'Coastguard Station' are no longer denoted near the northeast Temporary Construction Area, however, the buildings are still shown.
1932 (1:2,500)	• The 'North Beck Drain' is diverted outside of the northeast Temporary Construction Area Site boundary.	• A 'Well' is shown near the buildings formerly identified as a 'Coastguard Station' near the northeast Temporary Construction Area.

Date and Scale	Significant Features Onsite	Significant Features Off-Site (within 500m radius)
	• A small building is shown near the southern boundary of the Pipeline area.	
1938 (1:10,560)	• No significant changes.	• No significant changes.
1946 – 1947 (1:10,560)	• A further small building is denoted near the southern boundary of the Pipeline area.	• No significant changes.
1947 – 1948 (1:10,560)	• No significant changes.	• No significant changes.
1947 – 1951 (1:10,560)	• No significant changes.	• Buildings are denoted approximately 500m west from the Pipeline area near the railway sidings.
1951 – 1956 (1:10,560)	• A 'Gypsum Disposal Bed' is denoted partially on the West Site boundary and extends further southeast off-Site. • The 'L.N.E.R. Grimsby District Electric Light Railway' is no longer shown in the Pipeline area.	• Buildings and railway lines associated with a 'Chemical Factory' are denoted approximately 350m southeast from the northeast Temporary Construction Area.
1964 (1:2,500)	• 'Drains' are denoted in the West Site and the Pipeline area. • Further small buildings are denoted on the Site boundary of the West Site. • Electricity lines are denoted through the East Site.	• Buildings are denoted 30m west from the West Site. • 'Water' is denoted immediately south from the West Site. • 'Pipelines' are denoted immediately adjacent to the west of the Pipeline area and approximately 400m west from the Site. • One of the railway lines associated with 'L.N.E.R. Grimsby Electric Light Railway' is denoted as 'Disused' to the northwest of the East Site. • Several circular structures are denoted approximately 500m west from the East Site. • A 'Works'and 'Tanks' are shown adjacent to the 'Sewage Works' near the Pipeline area. • An 'Electric Sub Station' is shown approximately 10m southeast from the Pipeline area.

Date and Scale	Significant Features Onsite	Significant Features Off-Site (within 500m radius)
		• A 'Jetty' is denoted adjacent to the 'Sluice' on the Humber Estuary approximately 235m north from the East Site area. • 'Drains' are denoted to the east of the northeast Temporary Construction Area. • A 'Pond' is denoted approximately 80m east from the northeast corner of the Site. • The 'Chemical Factory' is now denoted as a 'Works'. • Multiple buildings, a 'Chimney' and circular structures associated with a 'Works' are denoted adjacent to 'Green Lane' approximately 270m east from the northeast Temporary Construction Area. • A 'Jetty' is denoted near the 'Works' approximately 428m east from the northeast Temporary Construction Area.
1965 – 1968 (1:2,500 and 1:10,560)	• The 'Spring' in the west of the Site is no longer shown and further 'Drains' are denoted.	• Several buildings are denoted adjacent to the West Site boundary near 'Kings Road'. • The 'Methodist Church' and 'Club' are no longer denoted, and a 'Hospital' and 'Warehouse' are shown in a similar location. • A 'Sports Ground' and a 'Pavilion' are denoted approximately 450m northwest from the West Site. • Buildings associated with 'Works' are denoted approximately 500m west from the Pipeline area. • The 'Gypsum Disposal Beds' to the east of the West Site are no longer shown.
1969 – 1972 (1:2,500)	• Electricity pylons are denoted through the West Site and extends further offsite. • 'Pipelines' are shown on the northwest Site boundary in the Pipeline area of the Site which extend off-site.	• An 'Electric Sub Station' is denoted approximately 40m west from the East Site. • An 'Oil Storage Depot' is denoted approximately 200m west from the East Site. • Multiple 'Tanks' are denoted within 500m west from the East Site associated with the 'Oil Storage Depot', an unspecified 'Works' and a 'Chemical Works'. • 'Electric Sub Stations' are denoted adjacent to the Site boundary and

Date and Scale	Significant Features Onsite	Significant Features Off-Site (within 500m radius)
		approximately 15m west from the West Site. • A 'Transforming Station' and a 'Pump House' are shown approximately 25m west and 200m west from the Site (West Site area) respectively. • The 'Engine Shed' associated with the railway sidings located to the north of the West Site area is no longer shown, and a 'Wagon Repair Shed', 'Tanks' and a smaller 'Engine Shed' are shown in a similar location. • A 'Pipeline' is shown approximately 320m north from the West Site area near the railway sidings. • A 'Warehouse' and 'Chemical Works' are denoted approximately 85m and 80m east from the East Site respectively on 'Laporte Road'. • An 'Oil Storage Depot' with multiple 'Tanks' is denoted approximately 35m north from the East Site, near to the Humber Estuary. • 'Pipelines' and 'Jetty (Oil Terminal)' are denoted approximately 365m northwest from the East Site into the Humber Estuary. • Another 'Chemical Works' with multiple 'Tanks' is denoted approximately 100m east from the northeast corner of the Site.
1972 – 1976 (1:10,000)	• No significant changes.	• No significant changes.
1976 – 1979 (1:2,500)	• No significant changes.	• Further 'Tanks' and 'Chimneys' are denoted to the west of the East Site associated with the 'Oil Storage Depot' and 'Chemical Works'. • Two circular structures are denoted at the 'Sewage Works' to the east of the Pipeline area. • The 'Works' near the 'Sewage Works' to the east of the Pipeline area are no longer denoted.

Date and Scale	Significant Features Onsite	Significant Features Off-Site (within 500m radius)
		• A building associated with 'GVC' is shown approximately 270m east from the northeast Temporary Construction Area. • Further buildings and structures are shown associated with the 'Chemical Works' to the east of the northeast Temporary Construction Area.
1980 – 1985 (1:2,500 and 1:10,000)	• No significant changes.	• A 'GVC' and 'Pumping Station' are located adjacent to the Site boundary in the West Site area. • A 'Pipeline' is shown approximately 70m north from the West Site area. • Another 'GVC' is denoted approximately 230m southeast from the northeast Temporary Construction Area.
1985 – 1987 (1:2,500)	• The 'Springs' in the Pipeline area are no longer shown	• The 'Transforming Station' to the west of the West Site is now denoted as an 'Electric Sub Station' and the 'GVC' is denoted as a 'Gas Valve Compound'. • The 'Water' denoted immediately south of the West Site is no longer shown. • The circular structures at the 'Sewage Works' to the east of the Pipeline area are identified as 'Filter Beds'. • A 'Warehouse' is denoted approximately 500m southeast from the West Site. • A 'Pipeline' is denoted approximately 410m southeast from the Pipeline area and East Site, near the 'GVC' and 'North Beck Drain'.
1988 (1:10,000)	• No significant changes.	• The railway lines associated with the 'Works' adjacent to the northeast Temporary Construction Area are now identified as a 'Dismantled Railway'.
2001 (1:10,000)	• No significant changes.	• 'Works' are denoted approximately 50m northwest from the West Site area. • Small ponds are denoted within the 'Oil Storage Depot' to the west of the East Site. • The 'GVC' and 'pipeline' to the southeast of the northeast Temporary Construction Area are no longer denoted.

Date and Scale	Significant Features Onsite	Significant Features Off-Site (within 500m radius)
		• Further 'Works' are denoted adjacent to the eastern Site boundary in the northeast Temporary Construction Area.
2010 (1:10,000)	• No significant changes.	• A 'Recycling Centre' is denoted adjacent to the West Site boundary. • A pond is shown approximately 50m southeast from the West Site.
2022 (1:10,000)	• No significant changes.	• The 'Recycling Centre' located to the West Site is no longer shown. • Further ponds are shown to the southeast of the West Site. • Circular structures associated with the 'Oil Storage Depot' near the Humber Estuary are no longer shown and a 'pipeline' through the Port to the west of the Site is no longer shown.

Regulated Processes and Pollution Incidents

21.3.52 The following regulated processes and pollution incidents are recorded on the Site and within 500m from the Site boundary:

a. Recent industrial land uses on the Site include water pumping stations, energy production (landfill gas and a power station), vehicle services (hire, rental, services and repairs), industrial engineers, pylons, a chimney, tools and machine shops, recycling, reclamation and disposal and a gas governor.

b. Within 50m from the Site boundary, there are electrical features (pylons, electric sub stations), telecommunications, engineering services, distribution and haulage services, hoppers and silos, gas valve compounds, industrial products, fuel distributors and supplies, moorings and unloading facilities, recycling centres and a gas governor.

c. Three current Control of Major Accident Hazards (COMAH) Upper Tier sites associated with Exolum Immingham Limited and Associated British Ports (ABP) are recorded within the Site boundary. An historical Notification of Installations Handling Hazardous Substances (NIHHS) site is located within the Site boundary associated with Arkema Coatings Resin Limited.

d. A current COMAH site is located approximately 23m southeast from the Site boundary relating to Tronox Pigment UK Limited. A current lower tier COMAH site is operated by Associated British Ports approximately 432m northwest from the Site.

e. There are three hazardous substance storage / usage sites located at the following locations: approximately 68m south currently associated with

Arkema Coatings Ltd; 118m northeast that is operated by Associated Petroleum Terminals and 365m northwest that is operated by Origin UK Ltd.

f. Permits for Integrated Pollution Control records are held approximately 57m northeast for petroleum processes operated by Associated Petroleum Terminals. Integrated Pollution Control permits were held by Cray Valley Ltd for manufacture and use of organic chemicals. Permits are held by the following operators approximately 396m south from the Site: Innogy Cogeneration Ltd (for combustion processes); Millennium Inorganic Chemicals Ltd (for acid processes) (revoked) and Npower Cogen Energy Ltd (for combustion processes) (revoked). Millennium Inorganic Chemicals Ltd held permits for halogen processes approximately 486m southeast from the Site.

g. UK Power Reserve Limited hold a permit for licenced industrial activity (fuel combustion) within the Site boundary. There are multiple records for licenced industrial activities within 500m from the Site including Arkema Coatings Resins Limited approximately 76m south; UK Power Reserve Limited approximately 80m southwest; Immingham Power Limited approximately 81m southeast; Associated Petroleum Terminals Ltd approximately 108m north; Associated Petroleum Terminals Ltd approximately 144m northeast; Knauf UK approximately 306m northwest and 366m northwest; North Beck Energy Limited approximately 321m east; Integrated Waste Management approximately 323m southeast; PX Ltd and Npower Cogen Ltd approximately 346m southeast and 377m southeast; and Millennium Inorganic Chemicals, Tronox Pigment UK Ltd and Cristal Pigment UK Ltd approximately 486m southeast.

h. Hargreaves Industrial Services Ltd hold a permit for licenced pollutant release for coal and coke processes within the Site boundary. PD Ports hold a permit for coal and coke processes approximately 81m southwest from the Site. WTG Treatment Ltd hold a permit for timber manufacturing approximately 126m northwest and Knauf UK (Gypsum) hold a permit for other mineral processes approximately 180m northwest from the Site.

i. There are no records for radioactive substance authorisations within the Site boundary. Millennium Inorganic Chemicals Ltd held a permit for radioactive substance authorisations for the disposal pf radioactive waste approximately 477m south. The status is recorded as revoked / cancelled.

j. Immingham Water Recycling Centre hold permits for licenced discharges to controlled waters for sewage discharges into the River Humber located within the Site boundary.

k. A permit for a licenced discharge into controlled waters is held approximately 1m southwest of the Site for miscellaneous discharges (surface waters) into Stallingborough North Beck. Another permit is held for sewage discharges into an unnamed tributary of the North Beck Drain within approximately 44m southeast of the Site boundary. Two permits for licenced discharge into controlled waters was held on the Site boundary for sewage discharges into an unknown tributary of the North Beck Drain, although this was revoked in May 1995 and December 2000. Further permits are held between 58m

northwest and 261m northwest associated with sewage discharges, trade effluent and miscellaneous surface water discharges.

l. Pollution inventory substance records indicate that Non-Methane Volatile Organic Compounds (NMVOCs), methane, nitrogen oxides are reported annually as part of the Queens Road Power Station within the Site boundary. Records are provided for reporting thresholds of other substances as a result of the Queens Road landfill which encroaches on the boundary of the Site.

m. Pollution inventory waste transfer records are held within the Site boundary associated with the Queen's Road Power Station and Queens Road landfill which encroaches on the Site boundary. The descriptions relate to septic tank sludge, mixed municipal waste, street cleaning residues, landfill leachate.

n. There are three effective permissions for pollutant release to public sewer located within the Site boundary. These are associated with Integrated Waste Management Ltd and Inspectorate International Limited.

o. List 1 Dangerous Substance records include Riverside Electroplaters who operate a discharge of cadmium into the River Humber located within the Site boundary. List 1 Dangerous Substances are held at Immingham Landfill site and the Tankclean Tankwash site approximately 124m southeast. Immingham Oil Terminal and Millenium Inorganic Chemicals have authorisation for the discharge of mercury (other) and cadmium approximately 375m northwest and 486m southeast respectively. Immingham Stw discharged List 1 Dangerous Substances approximately 124m southeast, however, this is no longer active.

p. List 2 Dangerous Substance records within 50m of the Site boundary include historical releases of pH by Jefco Services Ltd approximately 9m northeast and unknown substances by Immingham Stw approximately 50m southeast. Associated Petroleum Terminals discharge iron and zinc into the River Humber approximately 59m northwest. Further List 2 Dangerous Substance discharge records are held between approximately 124m southeast and 375m northwest.

q. A pollution incident was recorded on 21st February 2003 associated with adhesives approximately 15m northwest from the Site. The land and air impact were recorded as Category 4 (No Impact) and the water impact was recorded as Category 3 (Minor).

r. A pollution incident occurred on 20th August 2001 approximately 78m northwest associated with oils and fuels. The water impact was recorded as Category 3 (Minor) and the air and land impact was recorded as Category 4 (No Impact). Another pollution incident occurred on 27th June 2003 approximately 79m southeast associated with organic chemicals / products. The air impact was recorded as Category 3 (Minor) and the water and land impact was recorded as Category 4 (No Impact). A pollution incident occurred on 25th July 2002 approximately 339n southeast associated with specific waste materials. The water, land and air impact were recorded as Category 4 (No Impact).

s. Pollution inventor substance records are held approximately 80m southwest (UK Power Reserve Limited), 81m southeast (Integrated Waste Management Limited), 347m southeast (Tronox Pigment UK Limited) and 367m northwest (Knauf UK).

t. Pollution inventory waste transfer records are held approximately 80m southwest (UK Power Reserve Limited), 81m southeast (Integrated Waste Management Limited), 347m southeast (Tronox Pigment UK Limited) and 367m northwest (Knauf UK).

Landfills

21.3.53 The boundary of an active landfill is partially located on the eastern side of the Site boundary, within the West Site area. The landfill is operated by Integrated Waste Management Ltd with a capacity of >25,000 tonnes excluding inert waste. The status is recorded as effective.

21.3.54 The border of an historical gypsum disposal bed waste site encroaches on the south-eastern side of the Site boundary, within the West Site and Pipeline areas of the site. A further historical waste site (landfill works) is located within the Site boundary in the West Site, although this relates to a planning application. A planning application for a waste transfer station is located 458m east from the Site.

21.3.55 Two historical landfill sites are recorded on the south-eastern boundary of the West Site and Pipeline areas and 369m southeast from the West Site within the Site, associated with refuse tips. A further historical landfill is located approximately 92m northwest from the proposed pipeline route within the Site associated with inert and industrial waste. The last input date was recorded as 31st December 1990.

21.3.56 There are five licenced waste sites located on the site, between approximately 41m and 304m from the Site:

a. Immingham Household Waste Recycling Centre is located within the Pipeline area, and is associated with household, commercial and industrial waste with a capacity for 25,000 tonnes. The status is recorded as ‘modified’.

b. Immingham Landfill Site is located 41m southeast from the West Site associated with household, commercial and industrial waste with a capacity of 25,000 tonnes. The status is recorded as ‘To PPC’.

c. Sandstop Recycling is located approximately 98m northwest from the Pipeline area associated with inert and excavation waste and treatment with a capacity of 25,000 tonnes. The status is recorded as ‘surrendered’ dated March 2017.

d. Immingham Oil Terminal is located approximately 108m north from the East Site associated with household, commercial and industrial waste with a capacity of 75,000 tonnes. The status is recorded as ‘modified’.

e. Immingham Landfill Site is located approximately 213m southeast from the West Site associated with a co-disposal landfill site and household, commercial and industrial waste. The capacity of the co-disposal site is

recorded as 75,000 tonnes and the capacity of the household, commercial and industrial waste site is recorded as 25,000 tonnes. The status of the site is recorded as 'IPPC'.

21.3.57 Immingham Dock Special Waste Transfer Station is located approximately 304m north from the East Site with a 25,000-tonne capacity. The status is recorded as 'surrendered' dated March 2000.

21.3.58 There are five records for waste exemptions between 50m and 250m from the Site, and a further twelve between 250m and 500m from the Site boundary.

Potential Historical Sources of Contamination

21.3.59 The potential sources of contamination include the following:

a. Made Ground, natural strata, soil leachate, groundwater and ground gas;
b. Historical railways and sidings within the Site boundary;
c. The historic gypsum disposal bed encroaching on the West Site boundary and off-site towards the east of the Site;
d. Pipelines located within the Site boundary;
e. Potential agricultural land use within the Site boundary;
f. Industrial land use within the Site boundary including energy production, vehicle services, industrial engineers, tool shops, recycling and disposal, industrial products and a gas governor;
g. An active landfill partially encroaching on the West Site boundary; and
h. Off-site sources including current and historical landfills within a 1km radius, industrial land use in the surrounding study area (current / former railway sidings and associated infrastructure, a sewage works, jetties, oil storage depots, chemical works, unspecified works, pipelines and warehouses).

Potential Pathways

21.3.60 The following pathways have been identified:

a. Dermal contact, direct contact, ingestion, inhalation and plant uptake for soil sources;
b. Vertical and lateral migration of contaminants via groundwater and surface run-off; and
c. Migration of ground gas.

Potential Receptors

21.3.61 Potential receptors include the following:

a. Human health.
b. Geology (Made Ground, superficial deposits and bedrock).
c. Hydrogeology (Unproductive, Secondary Undifferentiated and Principal Aquifers and groundwater).

d. Soils.

e. Development Infrastructure.

Environmental Risk Assessment

21.3.62 An Environmental Risk Assessment was undertaken as part of the Phase 1 Desk Study for the Site which has been used to determine the potential pollutant linkages and potential effects to ground conditions and land quality in this PEI Report. The Phase 1 Desk Study identified that the risk to receptors ranged between *Very Low* and *Moderate* for the Site, which is considered to be *Acceptable* using the LC:RM risk ratings. The following pollutant linkages were identified:

a. The risk to future site users is considered *Low* for all contaminant linkages;

b. The risk to adjacent site users is considered *Low* for all contaminant linkages;

c. The risk to buildings and infrastructure is considered *Moderate/ Low* to *Moderate* for all contaminant linkages;

d. The risk to shallow groundwater (within Secondary Undifferentiated Aquifer) is considered *Moderate / Low* for all contaminant linkages;

e. The risk to deep groundwater (Principal Aquifer of the Flamborough Chalk Formation) is considered *Moderate / Low* for all contaminant linkages;

f. The risk to surface water is considered *Moderate* for all contaminant linkages; and

g. The risk to flora and fauna is considered *Very Low* to *Low*.

Geotechnical Risks

21.3.63 A Geotechnical Risk Assessment and Initial Ground Hazards Assessment were undertaken as part the Development Appraisal Report (Ref 21-16). The Geotechnical Risk Assessment and Initial Ground Hazards Assessment noted the following:

a. There is a substantial risk, after control measures are applied, associated with instability in open excavations and shallow groundwater flooding excavations;

b. There is a tolerable risk, after control measures are applied, associated with the following:

   i. Aggressive ground conditions;

   ii. Existing services (underground and overhead);

   iii. Variable Made Ground; presence of soft / compressible strata at shallow and deep depths;

   iv. Hard digging associated with boulders in Glacial Till and obstructions in Made Ground; and

   v. The weathered zone in Chalk bedrock which may be unsuitable for foundations.

c. There is a trivial risk, after control measures are applied, associated with frost susceptible soils and impermeable stratum;

21.3.64 The Initial Ground Hazards Assessment identified the following:

a. There is a medium severity associated with aggressive ground. It is recommended that BRE test results should be used to determine the appropriate concrete mix;

b. There is a high severity associated with Made Ground. It is recommended that a GI is undertaken to determine the potential thickness and composition of Made Ground. It is noted that Made Ground will be unsuitable for shallow and deep foundations. Potential foundation solutions include excavation of Made Ground and replacement with engineered fill; use of vibro stone columns or deep piled foundations. The engineered fill solution may not be economical;

c. There is a high severity associated with soft and compressible strata, therefore it is recommended that a GI is undertaken at the Site. It is noted that the superficial deposits may be unsuitable for shallow and deep foundations. Potential solutions proposed include vibro stone columns; rigid inclusions founded in Glacial Till; settlement reducing piles founded in Glacial Till and deep piled foundations into competent material. The report also proposes to excavate Made Ground and replace with engineered fill, however, this may not be economical. Soil mixing via lime stabilisation may allow the construction of shallow foundations;

d. There is a medium severity associated with hard dig and potential for surface and buried obstructions. The proposed solution an allowance for hard dig to be included within the project programme and cost, as well as consideration with deep foundation design;

e. There is a medium severity associated with weathered bedrock. A GI is recommended to determine the potential thickness and composition of weathered bedrock. The weathered zone may be unsuitable for heavily loaded structures; therefore, it is recommended to use deep piled foundations into competent fresh material;

f. There is a very high severity associated with shallow groundwater. It is recommended that the project programme and cost should account for shallow groundwater conditions; and

g. There is a medium severity associated with soil and groundwater contamination, therefore, it is recommended that a GI is undertaken at the Site.

Future Baseline

21.3.65 As stated in the Scoping Report, the future baseline conditions for ground conditions and land quality are anticipated to remain unchanged from those as described above in the absence of the Project.

21.4 Design, Mitigation and Enhancement Measures

Embedded Mitigation Measures

21.4.1 The Project has been designed, as far as possible, to avoid and minimise impacts and effects to population and health through the process of design development, and by embedding mitigation measures into the design. A summary of the proposed embedded mitigation measures is provided as follows and in **Section 21.6**.

Mitigation Measures

21.4.2 A summary of the primary, secondary and or tertiary mitigation measures in relation to the geological and hydrogeological environment for the construction phase and operational phase is provided in the following paragraphs and summarised in **Section 21.6**.

Construction Phase Mitigation Measures

21.4.3 A GI will be undertaken at the Site to obtain geo-environmental and geotechnical site specific data which will be used for the following: an assessment of ground conditions at the Site; derivation of geotechnical parameters and use of data for land contamination risk assessments. The data from GI will also be used within the detailed design process. As part of the secondary mitigation measures for the Project, a CEMP would be prepared to mitigate the potential impacts (magnitude and significance (effect)) during construction. An outline CEMP will be prepared as part of the DCO application for the Project and will detail measures to limit the dispersal and accidental release of soil derived dusts, uncontrolled run-off and accidental releases of potential contaminants. The development will not commence until a detailed CEMP has been approved in writing by the Planning Authority and secured by requirement of the DCO.

21.4.4 An outline of a Remediation Strategy will be prepared to support the DCO application. It is anticipated that a final Remediation Strategy will be prepared as part of the CEMP. The Remediation Strategy will define the mitigation measures required for significant / unacceptable contamination risks and it will outline how the green hydrogen production facility earthworks will be undertaken during construction. The necessary works required in preparation of the Project, including Site clearance, will also be outlined in the strategy. As part of the Remediation Strategy, the potential for reuse of surplus materials will be considered, and the potential for disposal or onward management to ensure appropriate re-use of materials. If surplus materials can be reused on Site, the strategy will define any treatment measures required and will define a risk-based compliance criteria for soils to be screened against prior to potential reuse on Site. If soil materials are considered to be surplus, the soil materials will be classified under the *Waste Framework Directive (Waste FD) (2009/98/EC)* as hazardous (17-05-03) or non-hazardous (17-05-04) soils using a propriety assessment tool (e.g., "HazWasteOnline™". WAC testing will be required if waste is deemed as hazardous before disposal in a landfill.

21.4.5 To ensure suitable re-use of materials such as crushed concrete and soils, a Materials Management Plan (MMP) under CL:AIRE (2011) Definition of Waste: Development Industry Code of Practice, will be prepared and implemented for the Project to detail measures to classify, track, store, dispose and potentially re-use excavated materials encountered.

21.4.6 Following the GI and geotechnical assessments, the construction methodology of the Project will be assessed to reduce the potential risk associated with the development of preferential pathways if piling, other deep foundations or ground improvements are required. Preferential pathways may be created between the Made Ground, superficial Secondary Undifferentiated Aquifers and the Principal Aquifer in the bedrock as a result of the construction of the Project, such as through piled foundations. For example, if piled foundations are required and contamination is identified on the Site, it is anticipated that a piling risk assessment will be undertaken and will comply with industry best practice such as the EA Guidance “Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention” (Ref 21-29) and “Piling in Layered Ground: risks to groundwater and archaeology – Since Report SC0200074/SR” (Ref 21-30). Piling method statements should detail measures to protect the aquifer if there is potential to cause pollution.

21.4.7 If asbestos or asbestos containing materials are encountered in the GI, and the presence is confirmed and quantified in chemical screening and a risk assessment identifies a risk requiring mitigation, an Asbestos Management Plan (AMP) will be prepared and implemented. The outline AMP will be prepared as part of the ES and CEMP.

21.4.8 The proposed GI will aim to identify the potential suitability of excavated materials for re-use. Earthworks operations on the Site should be undertaken in accordance with BS1997:2004 Eurocode 7 (Ref 21-31), BS16907-1 to 7:2018 Earthworks (Ref 21-32); BS6031:2009 Code of Practice for earthworks (Ref 21-33) and National Highways (NH) guidelines including DMRB Series 600 ‘Earthworks’ (Ref 21-34).

21.4.9 It is anticipated that best practice guidance and mitigation measures outlined in the CEMP will be adhered to, to prevent or minimise spillage risks and impacts during the construction phase. The CEMP will also address accidental spillages associated with building construction, foundations, concrete usage and the management of concrete batching.

21.4.10 To minimise the potential for run-off from material stockpiles to surface water bodies, any stockpiled material stored on the Site will be stored at a suitable distance from watercourses. Furthermore, if such material stockpiles are not used within three months, temporary covers or reseeding measures, for soils, should be implemented. When the Project is reinstated, reseeding or covering of unused and exposed soils will be undertaken, and erosion protection matting may also be used. These mitigation measures will minimise the potential for sediment mobilisation via wind and water flows.

21.4.11 To further prevent the potential for surface run-off and mobilisation of potential contaminants, any washing of vehicles and equipment will be undertaken in controlled areas only. Such locations would be agreed with the local planning

authority and / or the EA and defined in the CEMP. **Chapter 17: Marine Water and Sediment Quality** and **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage** discusses further standard mitigation measures to prevent and minimise potential pollution to surface watercourses, such as through the use of an oil spill contingency plan and spill kits on site.

21.4.12 Construction workers on the Site will adhere to site specific health and safety assessments, legislation and regulations. Site-specific risk assessments and the use of personal protective equipment should be a pre-requisite for workers coming onto Site. Entry into excavations or any other enclosed space on a construction site should comply with confined space legislation and be assessed prior to entry. To minimise the risk to off-site human health, general best practice guidance should be followed on Site to minimise dust generation, as outlined in, for example, “Environmental Good Practice on Site”, 3rd Edition, CIRIA Publication C762 (Ref 21-35).

21.4.13 An Agricultural Land Classification Survey will be undertaken prior to the submission of the ES to confirm the subgrades of ALC Grade 3 land within the Site boundary.

21.4.14 If dewatering is required or trenchless techniques are required in high sensitivity groundwater environments, or if dewatering is required for open cut installation, a hydrogeological assessment will be undertaken. This will consider the impact on nearby abstractions / resources and potential draw down. A dewatering scheme will be prepared and implemented to manage water arising from the operations and water treatment prior to controlled discharge.

Operational Phase Mitigation Measures

21.4.15 For tertiary mitigation, the Project will operate in accordance with and comply with relevant legislation and regulations and the hydrogen production facility will be regulated by the Environment Agency through an Environmental Permit.

21.4.16 Potential impacts may arise during the operational phase related to potential accidental spillage of polluting materials. Embedded mitigation, which will include the use of impermeable surfacing and bunding, as well as secondary mitigation of process monitoring and an Environmental Management System, will minimise the potential risk associated with potential accidental spillages. **Chapter 17: Marine Water and Sediment Quality** and **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage** discusses further standard mitigation measures to prevent and minimise potential pollution to surface watercourses.

21.4.17 It is anticipated that workers would comply and adhere to appropriate site and task specific health and safety documentation required for legal compliance. Workers will comply with confined space legislation and assessments. If maintenance workers are required to undertake excavations during the operational phase, task and site specific assessments would be undertaken for each sub area of the Site, and sufficient information would be provided for such assessments to be undertaken. Workers will be required to use personal protective equipment prior to coming onto Site. Appropriate emergency environmental management plans and procedures, in accordance with legislation, regulations and industry best practice, will be in place for the

operational stage. It is also anticipated that the storage of hazardous substances on the Site would be approved by the LA and regulated by the Competent Authority through a Hazardous Substance Consent and COMAH.

Decommissioning Phase Mitigation Measures

21.4.18 The Project will have a design life of 25 years and could operate longer depending on market conditions. The green hydrogen production facility infrastructure will be decommissioned at an appropriate time after the operational phase. Above ground structures will be removed and suitably reused or recycled where possible or disposed. The process structures are generally modular to ease construction and de-construction underground pipelines are proposed to be left in situ and will be made safe. It is proposed that the land will be restored to a satisfactory state following the decommissioning and removal of above ground structures.

21.4.19 An outline Decommissioning Environmental Management Plan (DEMP) will be produced as part of the DCO application to minimise or avoid potential impacts associated with the decommissioning of green hydrogen production facility. A detailed Decommissioning Plan will be secured by requirement of the DCO.

21.4.20 The construction workers at the Site during the decommissioning phase will follow general best practice guidance and adhere to site specific health and safety risk assessments, legislation and regulations.

To minimise the mobilisation of potential contaminants from material stockpiles, stockpiled material will be stored at a suitable distance from watercourses and suitably covered if not used within three months.

21.5 Potential Impacts and Effects

21.5.1 This section discusses the potential ground conditions and land quality impacts and effects that may arise during the construction, operation and decommissioning of the green hydrogen production facility.

21.5.2 The DCO application would not make any provision for the decommissioning of the marine infrastructure or plant or equipment on the jetty topside. This is because the development would, once constructed, become part of the fabric of the Immingham port estate and would, in simple terms, continue to be maintained so that it can be used for port related activities to meet a long-term need. This is discussed further in **Chapter 2: The Project**.

21.5.3 A GI will be undertaken at the site to inform further assessments and engineering design based on encountered ground conditions. The results of the GI will be presented in the ES. The UK Specification for GI will be used to specify the GI, and it should be carried out in accordance with BS EN 1997-2:2007 Eurocode 7 (Ref 21-23), BS5930:2015+A1:2020 Code of practice for GIs (Ref 21-24) and BS10175:2011+A2:2017 Investigation of potentially contaminated sites Code of Practice (Ref 21-25).

21.5.4 Further assessment of contamination at the Site will be undertaken as part of the ES, including potential contamination sources, receptors and plausible pollutant linkages. This assessment will be undertaken in accordance with government

guidance and the UK framework for risk assessments for contaminated land, including the Land Contamination: Risk Assessment guidance (Ref 21-26) from the EA. The EA guidance for land contamination in assessing risks to controlled waters (Ref 21-27) and the principles of assessment in CIRIA C552 (Ref 21-28) will be taken account. Previous GI's have been undertaken in the Pipeline area and the West Site; therefore, additional areas of the site are being investigated as part of a GI to obtain a complete understanding of the ground conditions within the boundary of the entire Site. The data from previous GI's and the data obtained in the additional GI will be used to inform the assessment within the ES.

21.5.5 **Chapter 25: Cumulative and In-Combination Effects** of this PEI Report will consider the in-combination effects on geology, controlled waters and human health which could arise from the Project. This will be considered as part of the Cumulative and In-Combination Assessment.

21.5.6 The potential impacts associated with the construction, operational and decommissioning phases for ground conditions and land quality are associated with:

a. Direct contact with contamination;

b. Inhalation of dust and / or soil derived vapours;

c. Migration of ground gas; and

d. Vertical and lateral migration of contaminants via groundwater and surface run-off.

21.5.7 The assessment considers the receptors noted in **Paragraph 21.3.61**. A summary of the value (sensitivity) of the receptors is presented in **Table 21.11**.

Table 21.11 Value (sensitivity) of receptors

Aspect / Criteria	Resource / Receptor	Location	Sensitivity	Justification
Human Health				
Human Health	Workers and site visitors	Onsite	Medium	Workers and site visitors on Site are considered to be a Medium sensitivity due to the commercial / industrial land use. The workers and site visitors may be a receptor to potentially contaminated groundwater, soils and dust.
Human Health	Workers and site visitors	Offsite	Medium	The workers and site visitors located offsite are considered to be a Medium sensitivity due to the commercial / industrial land use within the wider area, including the Port of Immingham. The offsite workers and site visitors may be a receptor of potential contaminated groundwater, dust and vapours that could migrate offsite.
Geology (Bedrock)				
Geology Bedrock	Flamborough Chalk Formation Burnham Chalk Formation	The Flamborough Chalk Formation underlies the superficial deposits across the entire Site, apart from the western Site boundary. The Burnham Chalk Formation underlies the western site boundary and the Flamborough Chalk Formation.	Negligible	There are no geological exposures, and little / no local interest. The bedrock is overlain by thick superficial deposits.
Geology Superficial				
Geology	Tidal Flat Deposits	The entire Site, apart from the bank of the Humber Estuary.	Negligible	There are no geological exposures, and little / no local interest. In some areas, the Tidal Flat Deposits are overlain by Made Ground.

Aspect / Criteria	Resource / Receptor	Location	Sensitivity	Justification
Geology Superficial	Beach and Tidal Flat Deposits (Undifferentiated)	Northeastern boundary of the green hydrogen production facility of the Site, along the bank of the Humber Estuary.	Negligible	There are no geological exposures and little / no local interest.
Geology Superficial	Devensian Till	The entire Site, underlying the Tidal Flat Deposits.	Negligible	There are no geological exposures and little / no local interest. The Devensian Till is overlain by Tidal Flat Deposits.
Soils				
Soils	Soils (Beach and Tidal Flat Deposits and Tidal Flat Deposits)	The entire Site.	High	The West Site and the eastern half of the Temporary Construction Area are designated as ALC Grade 3.
Hydrogeology and Hydrology				
Groundwater (Bedrock)	Principal Aquifer (Flamborough Chalk Formation)	The entire Site.	High	The Flamborough Chalk Formation is designated as a Principal Aquifer, and there are multiple groundwater abstractions within a 1km radius from the site. An SPZ1, 2 and 3 are located within the Site boundary associated with a groundwater abstraction approximately 27m northwest from the Site. Unproductive superficial deposits may provide some protection to the Principal Aquifer. However, the borehole records indicate there are higher permeability layers of strata such as sand and warp.
Groundwater (Superficial)	Secondary (Undifferentiated) Aquifer (Beach and Tidal Flat	Northeastern boundary of the green hydrogen production facility of the Site, along the bank of the Humber Estuary.	Low - Medium	The Beach and Tidal Flat Deposits may support groundwater of a minor value as it is a Secondary Aquifer.

Aspect / Criteria	Resource / Receptor	Location	Sensitivity	Justification
	Deposits (Undifferentiated)			
	Unproductive Aquifer (Tidal Flat Deposits)	The entire Site, apart from the bank of the Humber Estuary.	Low	The Tidal Flat Deposits comprise of unproductive strata and are therefore designated as an Unproductive Aquifer.
Surface Water	Humber Estuary	The Humber Estuary is located within the Site boundary to the northeast of the Site.	High	The Humber Estuary is a WFD waterbody with a 'moderate' ecological classification and a 'fail' chemical classification in 2019.
Surface Water	North Beck Drain catchment	The North Beck Drain is located immediately east from the Site.	High	The North Beck Drain is a WFD waterbody with a 'moderate' ecological classification and a 'fail' chemical classification in 2019.
Surface Water	Habrough Marsh Drain	To the west of the Site.	High	The Habrough Marsh Drain is part of the North Beck Drain catchment, which had a 'moderate' ecological classification and a 'fail' chemical classification in 2019.
Development Infrastructure				
Development Infrastructure – Buildings and Services	Buildings	On Site in the future	High	There is potential for aggressive ground conditions and accumulation of ground gases at the Site which may degrade the foundations if the design does not account for the ground conditions.
Development Infrastructure – Buildings and Services	Services	On Site in the future	Medium	There is potential for aggressive ground conditions and accumulation of ground gases at the Site which may degrade the services if the design does not account for the ground conditions.
Ecological Systems				

Aspect / Criteria	Resource / Receptor	Location	Sensitivity	Justification
Ecological Systems	Humber Estuary	The Humber Estuary is located within the Site boundary to the northeast of the Site.	Very High	The Humber Estuary is designated as an SSSI, SPA, SAC and a Ramsar site.

Construction

21.5.8 This section contains an assessment of the potential impacts of the construction phase on the Project. There is potential for sediment bound contaminants of concern to be mobilised as a result of dredging operations for the marine development. The potential impacts are discussed further in **Chapter 17: Marine Water and Sediment Quality** and **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage**

21.5.9 The following impact pathways have been assessed prior to the implementation of mitigation measures:

a. Direct contact with contamination;

b. Inhalation of dust and / or soil derived vapours;

c. Migration of ground gas; and

d. Vertical and lateral migration of contaminants via groundwater and surface run-off.

21.5.10 There may be potential impacts to human health (on site workers and future site visitors), geology and soils, groundwater and surface water at the Site.

Direct contact with contamination and inhalation of dust / soil derived vapours and ground gas

21.5.11 Through the application of primary and tertiary mitigation, human health receptors include on site workers and future site visitors are not likely to be affected during the construction stage.

21.5.12 Without appropriate controls, construction activities on the Site including foundation construction, earthworks, excavations and movement of ground materials may expose on site workers and future site visitors to potentially contaminated dust. The construction activities may result in the removal, relocation or mobilisation of existing potential contaminants which could have an adverse effect on human health. However, a GI will be undertaken across the Site to obtain site specific geo-environmental data for land contamination risk assessments that will assess the potential impact to human health. Workers on the Site will comply with the relevant health and safety legislation, site specific risk assessments and will also use PPE on the Site. The construction phase may also result in potential temporary impacts to human health arising from accidental spillages and leakages from vehicular plant and stored liquids, as well as the use of substances or materials that have the potential to become a pollutant (concrete, fuel, oils and soil). Such spillages, leakages and substance / material use may be mobilised to the ground or controlled waters. However, the Site will be operated in accordance with the relevant legislation, regulations, licence/permit, the Construction Environmental Management Plan (CEMP) and standard industry practices to mitigate the potential impacts.

21.5.13 Without implementation of the appropriate mitigation measures and controls, the construction phase may result in adverse impacts on the geology and soils underlying the Site through the potential risk of creating new Source-Pathway-Receptor linkages. The soils on the Site could be degraded through the construction activity due to the presence of heavy plant machinery and vehicle

movement. The construction phase may also result in increased soil erosion, changes in topography and ground stability impacts. Waste soils may be generated in the event that the soils cannot be reused within the Site boundary and will hence require off-site disposal. However, it is anticipated that the Site will be operated in accordance with the CEMP, relevant legislation, regulations, permits / licences and standard industry practices that will minimise the potential for adverse impacts to geology and soils. There is potential for beneficial impacts during the construction stage if any contaminated soil that is encountered is treated or removed, therefore removing the potential for adverse effects on the receptor. Drainage on the Site may also reduce the potential for soil erosion.

Migration and accumulation of ground gas

21.5.14 There is potential for ground gas to accumulate within temporary structures erected on Site during the construction phase. BGS mapping indicates Made Ground is present within the Site boundary, and warp was encountered within BGS borehole records which may be a source of ground gas. The underlying organic rich soils and Flamborough Chalk Formation may be a further source of ground gas as well as the landfills located in the vicinity of the Site within the study area. Furthermore, the GI undertaken by RSK (Ref 21-19) of the southern half of the East Site recorded elevated methane concentrations. However, a GI will be undertaken across the Site to obtain site specific data, including for gassing potential, which will be used in risk assessments to implement appropriate remediation and / or ventilation measures. Entry into any enclosed spaced or excavation on a construction site should comply with confined space legislation and be assessed prior to entry.

Vertical and lateral migration of contaminants via groundwater and surface run-off

21.5.15 Without implementation of appropriate mitigation measures, the construction phase may result in potential contamination to controlled waters (Secondary Undifferentiated Aquifer, Unproductive Aquifer, Principal Aquifer, Humber Estuary, North Beck Drain and Habrough Marsh Drain).

21.5.16 There is potential for disruption to shallow groundwater as a result of excavations and foundations if mitigation measures are not implemented. Excavations may fill with groundwater and therefore require temporary groundwater controls such as physical cut-offs or dewatering. In the immediate area of the excavation, it is likely that the groundwater levels would be lowered. Preferential flow pathways for groundwater may also be created as a result of service trenches. Therefore, there is potential for an adverse risk to groundwater if mitigation measures are not implemented. Dewatering controls may also draw contaminated groundwater on Site if any contaminated groundwater is present. This may result in changes to the hydrogeological regime and may affect the aquifers beneath the Site. However, it is anticipated that a hydrogeological assessment will be undertaken that will consider potential impacts to nearby abstractions and resources. A dewatering scheme will also be implemented that will minimise the impact associated groundwater controls during the construction phase.

21.5.17 There is potential for accidental spillages and leakages associated with fuels and oils from vehicular plant equipment, stored liquids and other polluting materials

which could potentially be mobilised to surface water and groundwater as a result of run-off and lateral or vertical migration if appropriate mitigation measures are not implemented. However, a development specific CEMP will mitigate the potential risks and it is anticipated that the Site will operate in compliance with the relevant environmental permit requirements.

21.5.18 Preferential pathways and new Source-Pathway-Receptor linkages may be created during the construction phase, particularly if piled foundations are required through Made Ground into underlying natural soils or bedrock. This may result in adverse impacts to the superficial (Unproductive and Secondary Undifferentiated Aquifers of the Tidal Flat Deposits and Beach and Tidal Flat Deposits respectively) and bedrock aquifers (Principal Aquifer of the Flamborough Chalk Formation) on the Site if appropriate mitigation measures are not applied. However, if piled foundations are required, a piling risk assessment will be undertaken and piling method statements should detail the measures to protect the aquifer if there is potential to cause pollution. The GI will obtain site specific data on the geo-environmental conditions at the Site, and will inform land contamination risk assessments that will consider the risk to the aquifers present on Site.

21.5.19 There is potential for the removal, relocation or mobilisation of potential contaminants as a result of the disturbance and / or removal of ground material and groundwater during foundation construction, earthworks and excavations if mitigation measures are not implemented. However, the Site will be operated in accordance with the CEMP during the construction phase which will mitigate potential impacts associated with the disturbance and removal of ground material and groundwater.

21.5.20 Without appropriate mitigation measures, potential contaminant linkages or mobilisation of existing contaminants may arise from the exposure of soils / increases in rainwater infiltration through changes in ground cover / in bulk earthworks and excavations. However, the Site will be operated in accordance with the CEMP during the construction phase which will mitigate potential impacts associated with potential contaminant mobilisation during the construction phase.

Operation

21.5.21 This section contains an assessment of the potential impacts of the operational phase on the Project.

21.5.22 The following impact pathways have been assessed prior to the implementation of mitigation measures:

a. Direct contact with contamination;

b. Inhalation of dust and / or soil derived vapours;

c. Migration of ground gas; and

d. Vertical and lateral migration of contaminants via groundwater and surface run-off.

Direct contact with contamination and inhalation of dust / soil derived vapours and ground gas

21.5.23 Although future on site workers and site visitors are anticipated to spend longer durations of time on the Site, it is anticipated that direct contact and inhalation will be unlikely due to the presence of hardstanding on the Site which will remove the pathway in the pollutant linkage. Direct contact and inhalation are also considered unlikely as the site will be regulated by the EA through the Environmental Permit. The Site will also be regulated by the Health and Safety Executive through the implantation of Hazardous Substance COMAH licence. The human health receptors may change from the baseline conditions as additional human health receptors may include site workers, commercial users and visitors.

21.5.24 The geology and soils beneath the Site are unlikely to be receptors during the operational stage as the Site will be covered in hardstanding which will remove the pathway in the pollutant linkage.

Migration and accumulation of ground gas

21.5.25 Ground gas may accumulate and migrate beneath the structures built within the Site due to the presence of Made Ground, warp and organic deposits and bedrock beneath the Site and landfills in the vicinity of the Site. However, a GI will be undertaken at the Site prior to the ES, and the gassing potential of the Site will be determined. The results of the gassing potential will be interpreted and used in risk assessments to inform and implement appropriate remediation and / or ventilation measures. The design and build of structures will incorporate ground gas protection measures as necessary. An Operational Environmental Management Plan will also mitigate the potential risk associated with the migration and accumulation of ground gas.

Vertical and lateral migration of contaminants via groundwater and surface run-off

21.5.26 There is potential for accidental spillages and leakages from the handling of fuels, lubricants, stored chemicals and process liquids and infrastructure on the Site (pipelines, tanks and storage facilities) during the operational phase which may affect groundwater and surface water via surface run-off and lateral and vertical migration if appropriate mitigation measures are not applied. However, the Site will be operated in accordance with the Environmental Permit, relevant legislation, regulations, licence/permit and standard industry practices to mitigate the potential impacts. The site will also be regulated by the Health and Safety Executive through the implantation of Hazardous Substance Consents and the COMAH licence which will further mitigate the potential impacts.

Decommissioning

21.5.27 This section contains an assessment of the potential impacts of the decommissioning phase of the green hydrogen production facility on the Project.

21.5.28 The following impact pathways have been assessed prior to the implementation of mitigation measures:

a. Direct contact with contamination;

b. Inhalation of dust and / or soil derived vapours; and

c. Vertical and lateral migration of contaminants via groundwater and surface run-off.

Direct contact with contamination and inhalation of dust / soil derived vapours and ground gas

21.5.29 Human health receptors (future on site workers and site visitors) may be affected during the decommissioning stage if the ground is broken to remove the above ground structures on the Site. If there is any contamination beneath the Site, the decommissioning works may result in the removal, relocation or mobilisation of existing potential contaminants which could have an adverse effect on human health if appropriate mitigation measures are not applied. However, the Site will be operated in accordance with a DEMP, relevant legislation, regulations, licence/permit and standard industry practices to mitigate the potential impacts. Workers on site will adhere to site specific risk assessments and the requirement to use personal protective equipment on the Site. Entry into excavations or any other enclosed space on a construction site should comply with confined space legislation and be assessed prior to entry.

21.5.30 The breaking of ground during the decommissioning phase may result in the creation of new Source-Pathway-Receptor linkages which may have an adverse impact on the geology and soils underlying the Site if appropriate mitigation measures are not applied. If there are any contaminants on the Site, the breaking of ground to remove above ground structures may result in the mobilisation of contaminants. Heavy plant and machinery and vehicle movements may degrade the soils on the Site. However, this is considered to be unlikely as any effects on the soils would have occurred during the construction of the project. Furthermore, the Site will be operated in accordance with the DEMP, relevant legislation, regulations, licence/permit and standard industry practices to mitigate the potential impacts.

Vertical and lateral migration of contaminants via groundwater and surface run-off.

21.5.31 There is potential for accidental spillages and leakages from plant and machinery, as well as fuels, stored chemicals, process liquids and lubricants that are stored and used on Site during the decommissioning phase. This may migrate via surface run-off and lateral and vertical migration to surface water receptors and groundwater receptors respectively if appropriate mitigation measures are not applied. However, the Site will be operated in accordance with the DEMP, relevant legislation, regulations, licence/permit and standard industry practices to mitigate the potential impacts.

21.5.32 The removal of structures on the Site may require dewatering, which could have an adverse effect on the hydrogeological regime, such as the lowering of groundwater if appropriate mitigation measures are not applied. However, the Site will be operated in accordance with the DEMP, relevant legislation, regulations, licence/permit and standard industry practices to mitigate the potential impacts.

21.5.33 There is potential for run-off associated with stockpiled material that is not covered, which may migrate to nearby surface watercourses and groundwater beneath the Site if appropriate mitigation measures are not applied. However, the Site will be operated in accordance with the DEMP, relevant legislation, regulations, licence/permit and standard industry practices to mitigate the potential impacts.

21.6 Preliminary Assessment of Residual Effects

Construction

21.6.1 Based on the current understanding of ground conditions and land quality at the Site and based on the implementation of the embedded and standard mitigation measures as detailed herein, this preliminary assessment of effects for the Project has concluded that the residual impact varies between Neutral Adverse and Slight Adverse. A summary of the residual impact for each receptor is presented in **Table 21.12**.

21.6.2 It is anticipated that any potential impacts associated with construction phase will be localised and short term as the works will be undertaken in compliance with the CEMP and environmental good practice. This will minimise the potential risk to off-site human health receptors and receptors on the Site. Any previously unidentified contamination that could be mobilised or disturbed during the construction phase is therefore considered to present a neutral to slight magnitude of impacts. If the previously unidentified contamination is identified and remediated, this may present a slight beneficial effect to the geology and soils.

21.6.3 The construction phase may result in the mobilisation of contaminants that could impact human health and could create preferential pathways to groundwater, particularly during any earthworks on the Site. However, it is anticipated that the mitigation measures outlined in **Section 21.4** and **Table 21.12** will reduce the residual impact associated with these pathways.

Operation

21.6.4 Based on the current understanding of ground conditions and land quality at the Site, and based on the implementation of the embedded and primary, secondary and tertiary mitigation measures as detailed in **Section 21.4**, this preliminary assessment of effects for the Project has concluded that the residual impact varies between Neutral Adverse and Slight Adverse. A summary of the residual impact for each receptor is presented in **Table 21.12**. It is considered that the operational phase of the Project will be operated in accordance with best practice guidance, the relevant legislation and regulations, an Environmental Permit and site-specific health and safety documentation.

Decommissioning

21.6.5 Based on the current understanding of ground conditions and land quality at the Site, it is considered that the impact significance during the decommissioning phase prior to the implementation of mitigation measures varies between Neutral

Adverse and Moderate Adverse. A summary of the impact significance for each receptor is presented in **Table 21.12**

21.6.6 Based on the implementation of the embedded and standard mitigation measures as detailed in **Section 21.4**, this preliminary assessment of effects for the Project has concluded that the residual impact varies between Neutral Adverse and Slight Adverse. A summary of the residual impact for each receptor is presented in **Table 21.12**.

21.7 Summary of Preliminary Assessment

21.7.1 In summary, the potential receptors of the Project include human health, geology, soils, controlled waters and development infrastructure.

21.7.2 The preliminary assessment demonstrates that the construction phase, operational phase and decommissioning phase will result in Neutral to Slight Adverse impacts on the identified receptors following the implementation of embedded mitigation measures. A summary of the residual effects and mitigation measures is provided in **Table 21.12**.

21.7.3 The final outcomes of the likely significant effects of the Project on ground conditions and land quality will be reported within the Environmental Statement.

Table 21.12: Summary of impact pathways, mitigation measures and residual effects

Receptor	Impact Pathway	Effects before Mitigation Measures	Mitigation Measure	Effect	Confidence
Construction Phase					
Human Health Onsite workers Site visitors	Direct contact with contaminated soils, exposure to contaminated groundwater and exposure / inhalation of dust / soil derived vapours and ground gas.	Moderate Adverse	Construction works will be carried out in accordance with the CEMP, site specific health and safety legislation and regulations and general best practice guidance. Workers will be required to wear PPE. If asbestos is encountered, an AMP will be prepared and implemented. A GI will be undertaken at the site to obtain data on geotechnical and geo-environmental conditions which will be completed prior to the submission of the ES. The GI data will be used to inform land contamination risk assessments. A Remediation Strategy will be prepared to define mitigation measures for significant contamination and will outline how earthworks will be undertaken. If asbestos is encountered in the GI, an AMP will be prepared and implemented. An MMP will also be implemented to classify, track, store, dispose and potentially re-use excavated materials encountered.	Slight Adverse	High
Human Health Offsite workers site visitors	Exposure to contaminated groundwater and exposure / inhalation of dust / soil derived	Moderate Adverse	Construction works will be carried out in accordance with the CEMP, site specific health and safety legislation and regulations. Works will also adhere to general best practice guidance such as “Environmental Good Practice on Site”, 3rd Edition, CIRIA	Slight Adverse	High

Receptor	Impact Pathway	Effects before Mitigation Measures	Mitigation Measure	Effect	Confidence
	vapours and ground gas.		Publication C762 (Ref 21-35) to minimise dust generation off-site. A GI will be undertaken at the site to obtain data on geotechnical and geo-environmental conditions which will be completed prior to the submission of the ES. The GI data will be used to inform land contamination risk assessments. A Remediation Strategy will be prepared to define mitigation measures for significant contamination and will outline how earthworks will be undertaken. If asbestos is encountered in the GI, an AMP will be prepared and implemented. An MMP will also be implemented to classify, track, store, dispose and potentially re-use excavated materials encountered.		
Geology Beach and Tidal Flat Deposits Tidal Flat Deposits Devensian Till Flamborough Chalk Formation	Piling foundations	Slight Adverse	Construction works will be carried out in accordance with the CEMP. The construction methodology will be assessed and Piling Risk Assessments will be prepared and implemented. Environmental good practice will be adhered to on site. A GI will be undertaken at the site to obtain data on geotechnical and geo-environmental conditions which will be completed prior to the submission of the ES.	Neutral Adverse	High
Soils Beach and Tidal Flat Deposits	Spoil arising from earthworks and excavations and degradation due to plant heavy plant	Moderate Adverse	An Agricultural Land Classification Survey will be undertaken to confirm the subgrades of Grade 3 land prior to the submission of the ES. A GI will be undertaken at the Site to obtain site-specific geotechnical and geo-	Slight Adverse	High

Receptor	Impact Pathway	Effects before Mitigation Measures	Mitigation Measure	Effect	Confidence
Tidal Flat Deposits	machinery and vehicle movement. Loss of potential versatile agricultural land.		environmental data and will be completed prior to the submission of the ES. The following standards will be adhered to during earthworks operations: with BS1997:2004 Eurocode 7 (Ref 21-33), BS16907-1 to 7:2018 Earthworks (Ref 21-32); BS6031:2009 Code of Practice for earthworks (Ref 21-33) and National Highways (NH) guidelines including DMRB Series 600 'Earthworks' (Ref 21-34). A Remediation Strategy will be prepared and implemented. Any surplus material will be re-used where possible subject to the requirements within the Remediation Strategy and MMP.		
Groundwater (Superficial Contamination) Beach and Tidal Flat Deposits (Secondary Undifferentiated Aquifer)	Vertical and lateral migration of contaminants via groundwater and surface run-off associated with: Potential vertical migration of spills and leakages. Potential for contaminant mobilisation during construction. Potential for creation of new preferential	Moderate Adverse	The GI will obtain geo-environmental data including groundwater levels and quality and will be completed prior to the submission of the ES. The GI data will inform the land contamination risk assessments. Construction works will be carried out in accordance with the CEMP and best practice guidance to minimise potential spillages and mobilisation of contaminants. Any proposed piling works would be subject to foundation risk assessments (e.g., a Piling Risk Assessment) and should be undertaken in accordance with best practice guidance. Piling method statements should detail measures to protect the aquifer if there is potential to cause pollution. A hydrogeological assessment and a	Neutral / Slight Adverse	High

Receptor	Impact Pathway	Effects before Mitigation Measures	Mitigation Measure	Effect	Confidence
	pathways and contaminant pathways. This may arise from piling, exposure of soils, increased rainwater infiltration due to ground cover changes and excavations.		dewatering scheme will be applied and implemented if dewatering is required or trenchless techniques are required in high sensitivity groundwater environments.		
Groundwater (Bedrock Contamination) Flamborough Chalk Formation and Burnham Chalk Formation (Principal Aquifer)	Vertical and lateral migration of contaminants via groundwater and surface run-off associated with: Potential vertical migration of spills and leakages. Changes to the hydrogeological regime. Potential for contaminant mobilisation during construction. Potential for creation of new preferential	Moderate Adverse	The GI will obtain geo-environmental data including groundwater levels and quality and will be completed prior to the submission of the ES. The GI data will inform the land contamination risk assessments. Construction works will be carried out in accordance with the CEMP and best practice guidance to minimise potential spillages and mobilisation of contaminants. Any proposed piling works would be subject to foundation risk assessments (e.g., a Piling Risk Assessment) and should be undertaken in accordance with best practice guidance. Piling method statements should detail measures to protect the aquifer if there is potential to cause pollution. A hydrogeological assessment and a dewatering scheme will be applied and implemented if dewatering is required or trenchless techniques are required in high sensitivity groundwater environments.	Slight Adverse	High

Receptor	Impact Pathway	Effects before Mitigation Measures	Mitigation Measure	Effect	Confidence
	pathways e.g. during piling.				
Surface Water (Contamination) Humber Estuary	Potential for run-off associated with exposed ground and material stockpiles into the Humber Estuary. Surface run-off associated with spills and leakages from vehicles or stored materials into the Humber Estuary. Direct disturbance of the riverbed or bank.	Moderate Adverse	Construction works will be carried out in accordance with the CEMP and best practice guidance to minimise potential spillages and mobilisation of contaminants. Stockpiled materials will be stored at a suitable distance from surface watercourses to prevent run-off and should be suitability covered or reseeded if the stockpiled materials are not used within three months. Washing of plant and materials will only be undertaken in controlled areas. Chapter 17 Marine Water and Sediment Quality and Chapter 18 Water Quality, Coastal Protection, Flood Risk and Drainage discusses further guidance relating to the control of water pollution from construction sites.	Slight Adverse	High
Surface Water (Contamination) North Beck Drain (waterbody and catchment) including the Habrough Marsh Drain	Potential for run-off associated with exposed ground and material stockpiles. Surface run-off associated with spills and leakages from vehicles or stored materials into the North Beck Drain on the eastern perimeter of the Site and the	Moderate Adverse	Construction works will be carried out in accordance with the CEMP and best practice guidance to minimise potential spillages and mobilisation of contaminants. Stockpiled materials will be stored at a suitable distance from surface watercourses to prevent run-off and should be suitability covered or reseeded if the stockpiled materials are not used within three months. Washing of plant and materials will only be undertaken in controlled areas. Chapter 17 Marine Water and Sediment Quality and Chapter 18 Water Quality, Coastal Protection, Flood Risk and Drainage	Slight Adverse	High

Receptor	Impact Pathway	Effects before Mitigation Measures	Mitigation Measure	Effect	Confidence
	Habrough Marsh Drain to the west of the Site. This may affect the wider North Beck Drain catchment.		discusses further guidance relating to the control of water pollution from construction sites.		
Operational Phase					
Human Health (Contamination) Future on site workers	Exposure to contaminated groundwater and exposure / inhalation of dust / soil derived vapours and ground gas.	Moderate Adverse	Operations will be required to comply with the relevant legislation and regulations, including the Environmental Permit, Hazardous Substance Consents, site and task specific health and safety documentation required for works undertaken at the Site. As a result, significant effects are considered to be unlikely. Workers will be required to use personal protective equipment prior to coming onto Site and will comply with confined space legislation and assessments.	Slight Adverse	High
Human Health (Contamination) Future site visitors Off-site workers	Exposure to contaminated groundwater and exposure / inhalation of dust / soil derived vapours and ground gas.	Moderate Adverse	The human health of future site visitors and off-site workers does not require mitigation measures as the operation of the proposed development is unlikely to cause significant effects to off-site receptors. Compliance with the Environmental Permit, Hazardous Substance Consents, site and task specific health and safety documentation required for works undertaken at the Site will minimise	Neutral / Slight Adverse	High

Receptor	Impact Pathway	Effects before Mitigation Measures	Mitigation Measure	Effect	Confidence
			any effects to off-site workers and future site visitors.		
Geology (Contamination) Superficial Deposits and Bedrock	Exposure to potential contaminants arising from spillages and leakages on the Site that migrate vertically into the geology underlying the Site.	Slight Adverse	No mitigation measures are required as the Site will be covered in hardstanding / impermeable surfacing, and it is assumed that the Site will be operated in accordance with an Environmental Permit and Hazardous Substance Consents.	Neutral Adverse	High
Controlled Waters (Contamination) Superficial Secondary Aquifer Principal Bedrock Aquifer Humber Estuary North Beck Drain and wider catchment (including the Habrough Marsh Drain)	Surface run-off and lateral / vertical migration arising from potential accidental spillages and leakages from handling of fuels, lubricants, and stored chemicals. This may impact surface waters and groundwater.	Moderate Adverse	It is anticipated that the Project will be operated in accordance with an Environmental Permit, Hazardous Substance Consents and there will be a managed surface drainage system and bunding as part of the Project. Chapter 17 Marine Water and Sediment Quality discusses further standard mitigation measures to prevent and minimise potential pollution to surface watercourses.	Slight Adverse	High
Development Infrastructure	Potential for exposure to potential contaminants in soil, leachate,	Moderate Adverse	It is anticipated that buildings and services will be designed to use concrete and service pipes that are appropriate to any aggressive ground conditions at the Site. The design and	Neutral / Slight Adverse	High

Receptor	Impact Pathway	Effects before Mitigation Measures	Mitigation Measure	Effect	Confidence
Buildings and services	groundwater and accumulation of ground gas.		build of structures will also incorporate ground gas protection measures suitable for the ground gas conditions at the Site.		
Decommissioning Phase					
Human Health (Contamination) Future site workers	Exposure to contaminated groundwater and exposure / inhalation of dust / soil derived vapours.	Moderate Adverse	A DEMP will be prepared and implemented at the Site. Workers will comply with general best practice on site, use personal protective equipment and comply with site-specific health and safety assessments and legislation.	Slight Adverse	High
Human Health (Contamination) Off-site workers Site visitors	Exposure to contaminated groundwater and exposure / inhalation of dust / soil derived vapours.	Moderate Adverse	A DEMP will be prepared and implemented at the Site. Workers will comply with general best practice on site, use personal protective equipment and comply with site-specific health and safety assessments and legislation.	Slight Adverse	High
Geology (Contamination) Superficial Deposits and Bedrock	Exposure to potential contaminants arising from spillages and leakages on the Site that migrate vertically into the geology underlying the Site.	Moderate Adverse	Works will comply with best practice guidance and the DEMP for the Site.	Neutral Adverse	High
Controlled Waters (Contamination)	Surface run-off and lateral / vertical migration arising from potential	Moderate Adverse	Works will comply with best practice guidance and the DEMP for the Site. Material stockpiles will be located a suitable distance from watercourses and will be suitably	Neutral / Slight Adverse	High

Receptor	Impact Pathway	Effects before Mitigation Measures	Mitigation Measure	Effect	Confidence
Superficial Secondary Aquifer Principal Bedrock Aquifer Humber Estuary North Beck Drain and wider catchment (including the Habrough Marsh Drain)	accidental spillages and leakages from handling of fuels, lubricants, stored chemicals may impact surface waters and groundwater.		covered if not used within three months to prevent mobilisation and run-off.		

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21.9 Abbreviations and Glossary of Terms

Table 21.2 Glossary and Abbreviations

Term	Acronym	Meaning
Agricultural Land Use Classification	ALC	The system devised and introduced by the Ministry of Agriculture, Fisheries and Food to classify agricultural land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. Land is graded between 1 (excellent quality) to 5 (very poor quality), with grade 3 subdivided into agricultural subgrades 3a and 3b.
Asbestos Management Plan	AMP	An Asbestos Management Plan details the location of asbestos and outlines how the presence of asbestos will be managed on site.
Aquifer	-	An underground layer of water-bearing permeable rock, rock fractures or unconsolidated materials (gravel, sand or silt).
Baseline	-	The environment as it appears (or would appear) immediately prior to the implementation of the project together with any known or foreseeable future changes that would take place before completion of the project.
Bedrock	-	Rock that underlies loose deposits such as soil or alluvium.
Below ground level	BGL	Term used to differentiate below ground from above ground.
Borehole	-	A hole bored into the ground, usually as part of investigations, typically to test the depth and quality of soil, rock and groundwater. A borehole can also be used to dewater the ground.
British Geological Survey	BGS	A body which aims to advance geoscientific knowledge of the United Kingdom landmass and its continental shelf by means of systematic surveying, monitoring and research.
California Bearing Ratio	CBR	A geotechnical test conducted to assess the strength condition of a soil. The results of CBR tests are often used in road pavement design.
Construction Environmental Management Plan	CEMP	A Construction Environmental Management Plan describes the specific mitigation measures to be followed by the appointed construction contractor to reduce potential nuisance impacts.

Term	Acronym	Meaning
Control of Major Accidents and Hazards Regulations 2015	COMAH	The Control of Major Accidents and Hazards Regulations 2015 aims to prevent and mitigate the effects of major accidents involving dangerous substances which can cause serious damage/harm to people and/or the environment.
Conceptual Site Model	-	A representation of the characteristics of the Site and indicates potential source areas of contamination, pathways and receptors (including human health, groundwater, surface water, ecology and buildings / infrastructure). It is used to identify potentially complete source-pathway-receptor (S-P-R) contaminant linkages.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008
Department for Environment, Food and Rural Affairs	Defra	The Government department responsible for policy and regulations on environmental, food and rural issues.
Decommissioning Environmental Management Plan	DEMP	A Decommissioning Environmental Management Plan describes the specific mitigation measures to be followed by the appointed construction contractor to reduce potential nuisance impacts during decommissioning.
Design Manual for Roads and Bridges	DMRB	The Design Manual for Roads and Bridges contains information about current standards relating to the design, assessment and operation of motorway and all-purpose trunk roads in the United Kingdom.
Design Sulphate Class	DS	A site classification based on the determined sulphate (including potential sulphate) contents of the ground and/or groundwater.
Drinking Water Standard	DWS	Evaluation criteria for groundwater to determine if the level of contaminant in groundwater is acceptable.
Environment Agency	EA	Government agency established to protect and improve the environment and contribute to sustainable development in England. Responsibilities include water quality and resources, flooding and coastal risk management and contaminated land.
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project in the environment are identified and assessed.
Environmental Quality Standards	EQS	The maximum permissible concentration of a potentially hazardous chemical.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.

Term	Acronym	Meaning
Generic Assessment Criteria	GAC	Criteria used in screening assessments for human health and controlled waters. The criteria state the maximum permissible concentration of a potentially hazardous chemical and takes into account the concentration of a substance, site characteristics, and the source-pathway-receptor behaviour.
Geology	-	The physical structure, substance and history of the earth (rocks and minerals).
Geotechnical Data	-	Properties of soil and/or rock which are used in engineering design.
Glacial Till	-	Unsorted and unstratified material deposited by glacial ice.
Groundwater	-	Water found underground in porous geological strata and soils.
Groundwater Dependent Terrestrial Ecosystems	GWDTE	These ecosystems are wetlands which critically depend on groundwater flows. They are protected by the Water Framework Directive.
Ground Investigation	GI	An intrusive investigation undertaken to collect information relating to the ground conditions, normally for geotechnical or land contamination purposes.
Hazard	-	A substance, operation or piece of equipment which has the potential to cause harm to people or the environment.
Highways England Water Risk Assessment Tool	HEWRAT	This tool is an Excel application which assesses acute and chronic pollution impacts on aquatic ecology associated with soluble and sediment-bound pollutants respectively.
Internal Drainage Board	IDB	A public body that manage water levels in an area, known as an internal drainage district, where there is a special need for drainage.
Institute of Environmental Management and Assessment	IEMA	A professional body for practitioners working in the fields of environmental management and assessment.
Land Contamination Risk Management	LC:RM	The Environment Agency guidance that must be adhered to associated with the assessment and management of the risks from land contamination.
Landscape Character Area	LCA	Areas of landscape that have a broadly consistent pattern of topography, land use and vegetation cover.

Term	Acronym	Meaning
Local Geological Site	LGS	Non-statutory geological sites considered worthy of protection for their earth science or landscape importance. Formerly known as Regionally Important Geological Sites.
Made Ground	-	Land where natural and undisturbed soils have largely been replaced by man-made or artificial materials. It may be composed of a variety of materials including imported natural soils and rocks with or without residues of industrial processes (such as ash) or demolition material (such as crushed brick or concrete).
Multi-Agency Geographic Information Service	MAGIC	A website which provides geographic information about the natural environment.
Materials Management Plan	MMP	A Materials Management Plan outlines how excavated material can be reused on site, including the classification, tracking, storage and disposal of excavated material.
National Nature Reserve	NNR	National Nature Reserves were established to protect some of our most important habitats, species and geology, and to provide ‘outdoor laboratories’ for research.
National Planning Policy Framework	NPPF	A planning framework which sets out the Government's planning policies for England and how these are expected to be applied.
National Policy Statement for Ports	NPSfP	The National Policy Statement for Ports provides the framework for decisions on proposals for new port development.
Nationally Significant Infrastructure Project	NSIP	A type of project listed in the Planning Act 2008, which must be consented by a Development Consent Order.
North-East Lincolnshire Council	NELC	Local authority of North-East Lincolnshire.
Nitrate Vulnerable Zone	-	Areas covering 62% of England designated as a result of the EU's Nitrates Directive in order to reduce the level of nitrates in surface and groundwater. Farmers with land in nitrate vulnerable zones have to follow mandatory rules to tackle nitrate loss from agriculture.
Ordnance Survey	OS	The national mapping agency for the UK.
Polybrominated Diphenyl Ethers	PDBE	Polybrominated diphenyl ethers are a group of man-made organobromine compounds.
Preliminary Environmental Information Report	PEIR	A report that compiles and presents the Preliminary Environmental Information gathered for a project.

Term	Acronym	Meaning
Perfluorooctane Sulphonate	PFOS	Perfluorooctane sulphonate belongs to a large, diverse group of man-made substances known collectively as perfluoroalkyl and polyperfluoroalkyl substances.
Principal Aquifer		Aquifers previously designated as major aquifer.
Ramsar	-	Wetlands of international importance designated under the Ramsar Convention.
Risk	-	The likelihood of a specified level of harm occurring within a specified period of time.
Regionally Important Geological Sites	RIGS	Regionally Important Geological Sites are sites of regional and local importance for their geology that have not been designated a Site of Special Scientific Interest.
Remediation Strategy	-	A Remediation Strategy is the overarching plan developed to achieve the remediation objectives agreed at the outset.
Scottish Environment Protection Agency	SEPA	Scotland's environmental regulator and national flood forecasting, flood warning and strategic flood risk management authority,
Site of Special Scientific Interest	SSSI	Area of land notified by Natural England under section 28 of the Wildlife and Countryside Act 1981 as being of special interest due to its flora, fauna or geological or physiological features.
Source Protection Zone	SPZ	Zones defined by the Environment Agency to protect groundwater sources such as wells, boreholes and springs from potential contamination.
Special Area of Conservation	SAC	Sites designated under EU legislation for the protection of habitats and species considered to be of European interest.
Special Protection Area	SPA	Sites designated under the European Directive on the Conservation of Wild Birds for the protection of birds in member states.
Superficial Deposit	-	A geological deposit that was laid down during the Quaternary period. Such deposits were largely formed by river, marine or glacial processes but can also include wind-blown deposits known as loess.
Tidal Flat Deposits	-	Soil deposits formed from mud flats in the intertidal zone.
United Nations Educational, Scientific and Cultural Ogranisation	UNESCO	A specialized agency of the United Nations aimed at promoting world peace and security through international cooperation in education, arts, sciences and culture.

Term	Acronym	Meaning
Unproductive Strata	-	Soil and/or rock layers with low permeability that have negligible significance for water supply or base flow for rivers.
Waste Acceptance Criteria	WAC	The criteria outlines the disposal requirements of waste to relevant landfill categories (hazardous, non-hazardous and inert). WAC samples are tested in a laboratory to determine which landfill category is suitable.
Waste Framework Directive	Waste FD	The Waste Framework Directive sets the basic concepts and definitions related to waste management, including definitions of waste, recycling and recovery.
Water Framework Directive	WFD	A European Union Directive which commits member states to achieve good status of all waterbodies (both surface and groundwater), and also requires that no such waterbodies experience deterioration in status. Good status is a function of good ecological and good chemical status, defined by a number of elements.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 22: Major Accidents and Disasters

Associated British Ports

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Table of Contents

Tables

22 Major Accidents and Disasters

22.1 Introduction

22.1.1 This chapter presents the preliminary findings of an assessment to determine the potentially adverse effects of the Project on the environment as a result of major accident and/or disaster (MA&D) scenarios which are relevant to the development. Relevant scenarios are those which could credibly arise during the construction, operation and decommissioning of the Project.

22.1.2 The potential adverse effects of the Project on the environment derive from the vulnerability of the development to relevant MA&Ds. Vulnerability is the potential for harm to occur as a result of the event, the assessment of which considers the consequences of the MA&D event scenario and the importance of the receptor. Within this assessment, effects are defined qualitatively by the nature of their consequences, size, and/or location.

22.1.3 This chapter includes a preliminary description of the measures which will be incorporated in the Project design to prevent or mitigate potential significant adverse effects of MA&D events on the environment and provides an overview of the preparedness for, and proposed response to, such emergencies.

22.1.4 The Health and Safety Executive (HSE) have established the concept of "*reasonably practicable*" as the risk-reduction goal for duty-holders established within the Health and Safety at Work Act 1974 (Ref 22-1). The mitigation measures associated with MA&D events must therefore be suitable and sufficient to reduce the risk of the event to a level that can be demonstrated to the HSE is 'as low as reasonably practicable' (ALARP).

22.1.5 In the context of Environmental Impact Assessment (EIA), the following definitions are provided within the published document "Major Accidents and Disasters in EIA: A Primer" published by the Institute of Environmental Management and Assessment (IEMA) (Ref 22-2):

a. "A major accident is an event (for instance, train derailment or major road traffic incident) that threatens immediate or delayed serious effects to human health, welfare and/or the environment and requires the use of resources beyond those of the client or its appointed representatives (e.g. contractors) to manage."

b. "A disaster is a man-made/external hazard (such as an act of terrorism) or a natural hazard (such as an earthquake) with the potential to cause an event or situation, which meets the definition of a major accident above."

22.1.6 This preliminary assessment of MA&Ds has considered the findings of a number of other key studies carried out in support of the Preliminary Environmental Information (PEI) Report, including the ongoing flood risk assessment, the identification of environmental and human health receptors in the locality of the Project, and the assessment of the vulnerability of receptors. As such, the following chapters of the PEI Report are pertinent to this assessment:

a. **Chapter 12: Marine Transport and Navigation.**

b. **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage.**

c. **Chapter 24: Human Health and Wellbeing.**

22.1.7 This MA&D chapter is supported by the following figures:

a. **Figure 22.1:** Major Accidents and Disasters Study Area (PEI Report, Volume III).

22.2 Approach to Assessment

Scope and Methods

22.2.1 A scoping exercise was undertaken in August 2022 to establish the methodology to be applied for the identification and assessment of MA&Ds. Currently, there is no singular approach for this type of assessment contained within the EIA Regulations, however guidance is available from sources such as IEMA (Ref 22-2).

22.2.2 The methodology used to identify credible major accidents relevant to the Project is based on an assessment of the properties of dangerous substances which could be present during the lifecycle of the Project, and the activities and operations involving these substances, from construction and operation to decommissioning and demolition.

22.2.3 The geographical location of the Project is also considered, to identify additional major accident scenarios and credible potential disaster scenarios. The Project location establishes the susceptibility of the Site to impacts such as climatic and seismic events and the vulnerability of receptors.

22.2.4 The location of the Site relative to industrial neighbours such as bulk fuel storage and chemical manufacturing facilities, can increase the risk to receptors from incidents which are referred to within the Control of Major Accident Hazards Regulations 2015 (the COMAH Regulations) (Ref 22-3) as ‘domino effects’. An example of such an event is a fire occurring at a COMAH facility which initiates an incident at a neighbouring COMAH facility. This category of scenario can include events at the Project site which can have an effect at a nearby industrial facilities and also events which are initiated at a nearby industrial facility which can reach the Project site. The assessment of MA&Ds considers the potential for these events to occur.

22.2.5 The criteria to define the level of harm to people and the environment which would constitute a MA&D is not defined within the Infrastructure Planning (EIA Regulations) 2017 (Ref 22-4). This assessment therefore considers the criteria for notification of a major accident hazard as established in the COMAH Regulations (Ref 22-3).

22.2.6 The COMAH Regulations (Ref 22-3) apply to sites in which quantities of hazardous materials are or could be present above defined thresholds. The substances stored in operational areas of the Project are expected to be present above the threshold quantities established in Annex 1 of the COMAH Regulations (Ref 22-3), and consequently this approach is considered reasonable for the preliminary assessment of MA&Ds carried out for this Project.

22.2.7 Schedule 5 of the COMAH Regulations (Ref 22-3) (now revoked) contained criteria for a major accident which would require notification to the European Commission. Following the exit of the UK from the European Union, this schedule was revoked and such notification is no longer required, however, this information can still be adopted as useful criteria to be used in the assessment of MA&Ds.

22.2.8 Criteria for a major accident includes the following based on the European Seveso III Directive on the Control of Major Accidents (Ref 22-5):

a. An injury to a person which is fatal;

b. Up to six persons are injured within the establishment and hospitalised for at least 24 hours;

c. One person outside the establishment is hospitalised for at least 24 hours;

d. A dwelling outside the establishment is damaged and is unusable as a result of the accident;

e. The evacuation or confinement of persons for more than 2 hours, where persons × hrs is at least 500;

f. The interruption of drinking water, electricity, gas or telephone services for more than 2 hours, where persons × hours is at least 1,000;

g. Damage to property in the establishment, to the value of at least €2million; or

h. Damage to property outside the establishment, to the value of at least €500,000.

22.2.9 The criteria for damage to the environment, which could be considered to represent a MA&D are also listed in Schedule 5 of the COMAH Regulations (Ref 22-3) which, although now revoked, provide useful guidance and include the following benchmarks:

a. Permanent or long-term damage to terrestrial habitats involving:

   i 0.5 hectares (ha) (equivalent to 5,000 m^2) or more of a habitat of environmental or conservation importance protected by legislation; or

   ii 10 or more hectares of more widespread habitat, including agricultural land.

b. Significant or long-term damage to freshwater and marine habitats involving:

   i 10 km or more of river or canal;

   ii 1 ha or more of a lake or pond;

   iii 2 ha or more of delta; or

   iv 2 ha or more of a coastline or open sea.

c. Significant damage to an aquifer or underground water of 1 ha or more.

22.2.10 Guidance provided by the HSE on the Pipelines Safety Regulations 1996 (Ref 22-6) defines a major accident in the context of a pipeline as:

a. A major accident would cover death or serious injury from a fire, explosion or uncontrolled emission from a pipeline. This includes both events which have escalated beyond the control of the normal operating envelope of the pipeline and those resulting from third party interference. Whether an event leads to serious danger to people will depend on factors specific to the incident. Major accidents to people can be distinguished from other accidents by the severity of the injuries, the number of casualties, or by the physical extent of the damage in areas where people may be present.

22.2.11 Guidance provided in IEMA (Ref 22-2) includes the following definition of a significant environmental effect in relation to MA&D:

a. Could include the loss of life, permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration.

22.2.12 The definition aligns with that which was contained in Schedule 5 of COMAH Regulations (Ref 22-3).

22.2.13 An initial consideration of MA&D was undertaken for the Project at the Scoping Stage. The objective of the assessment at that juncture was to identify the credible potential impacts within a qualitative, high-level analysis of MA&Ds.

22.2.14 The Scoping Report (**Appendix 1.A** of PEI Report, Volume IV) recorded the findings of the scoping exercise and details the relevant legislation, policy, information, technical guidance, standards, best practice and criteria applied in the assessment, to identify and evaluate credible potential MA&D scenarios pertinent to the Project.

22.2.15 Following receipt of the Scoping Opinion (**Appendix 1.B** of PEI Report, Volume IV) as to the information to be provided in the ES, the following requirements set out in **Table 22.1** have been identified by the Planning Inspectorate, which are being taken into account as part of the ongoing MA&Ds assessment.

Table 22.1 Scoping Opinion comments on major accidents and disasters

Consultee	Summary of Response	How comments have been addressed in this chapter
PINS	The Scoping Report states that study area for the assessment of major accidents and disasters is not defined within regulatory guidance or standardised methodology, but that the study area is based on experience and judgement and includes nearby major hazard sites, pipelines other sites whose land use planning zones may encroach on any part of the Proposed Development. The ES should contain a robust justification to support the chosen study area and sensitive receptors selected for the purposes of the ES assessment, based on professional guidance such as that published by IEMA (Ref 22-2). The study area should be consulted on and agreed with relevant consultation bodies where possible. Figure 2.1 in Appendix A is stated to provide a figure showing the site boundary with respect to infrastructure and industrial sites and natural features and protected environmental sites, however this does not appear to map any major hazard sites or receptors near to the Proposed Development. A figure showing relevant receptors and potential major hazard risks should be provided in the ES.	The PEI Report incorporates a bespoke figure (**Figure 22.1**, PEI Report, Volume III) to present the study area, clearly identifying the key receptors, infrastructure and existing major accident installations. Detailed text has been included in the PEI Report to describe receptors including other COMAH installations and environmental receptors including groundwater vulnerability. A radius of 5km from the Site boundary has been used to define the study area. The Site boundary has been adjusted following the submission of the Scoping Report, however the modifications made to the boundary have been assessed to have no impact on the study area. No specific comments on the geographic extent of the study area were made by consultees during scoping, however, the PEI Report has included a more detailed description of the area within 5km of the Site which is now supported by **Figure 22.1** (PEI Report, Volume III).
	The assessment should consider the vulnerability of the Proposed Development to a potential accident or disaster and the Proposed Development's potential to cause an accident or disaster including the use of Very Large Gas Carriers (VLGCs). The ES should also provide consideration of future hazards associated with transportation and storage of CO_2. The assessment should consider how any surrounding hazardous installations may impact on the major accident hazards arising from the Proposed Development's site operation. Any assessment should include consideration of the impact on surrounding hazardous	The potential for a MA&D associated with the use of VLGC was described within the Scoping Report and has been assessed further within the PEI Report. A description of the potential hazards associated with VLGCs is included in **Sections 22.6.16** to **22.6.19** inclusive. One credible major accident scenario was identified involving a release to the marine environment, defined as Risk Event 7. This event considers the potential for an accident as a result of a loss of containment from a VLGC.

Consultee	Summary of Response	How comments have been addressed in this chapter
	installations including potential cumulative effects from multiple major accidents which the Proposed Development could become part of cumulatively. Where qualitative assessments are made the professional qualifications and experience of the assessors should be made clear in the ES.	The future use of facilities within the scope of this project to transport and/or store carbon dioxide (CO_2) has been described in the MA&D Chapter as follows: CO_2 is another bulk liquid, in addition to ammonia, that is likely to be used at the new terminal in future. Specific proposals are being developed for the import and export of liquified CO_2 from carbon capture and storage projects elsewhere, but these are at an early stage and would be subject to a separate application for development consent. There are no identified chemical incompatibilities associated with operation of facilities such as the jetty to include CO_2 operations in addition to hydrogen and ammonia transfer. There would be engineering equipment, systems and procedures to prevent these materials coming into contact such as isolation valves and vents. Consequently, no detailed treatment of CO_2 accidents is incorporated within this MA&D chapter at this juncture (see **Paragraph 22.6.14**). Potential effects to and from nearby major accident hazard pipelines and installations have been described and considered throughout, in particular, **Tables 22.2** and **22.4** and **Section 22.6.7**). The potential for a domino event to have an impact on several sites cumulatively will be assessed at the ES stage, when Quantitative Risk Assessment (QRA) and consequence modelling will be undertaken to assess hazards in more detail. A paragraph describing qualifications and experience of the author is included in **Appendix 1.D** (PEI Report, Volume IV).

Consultee	Summary of Response	How comments have been addressed in this chapter
Health & Safety Executive	According to HSE's records the proposed site is in the vicinity of a number of major accident hazard installations with Hazardous Substances Consent. Given the nature of the proposal the site will need to consider all the major hazards associated with its proposed operations including both the impact on the surrounding hazardous Installations and how these installations may impact on the major accident hazards arising from the site operation. The site would likely need to be included in a domino group of sites. Also according to our records the site is in close proximity to a major hazards pipeline operated by Cadent Gas ltd. It is noted that the EIA recognise the potential impact of these major hazard operations on to the site, but consideration also needs to be given to the impact of the site onto these sites through the lifecycle of the facility including construction.	The PEI Report MA&D chapter includes a more detailed description of industrial neighbours and the potential for domino events than was included within the Scoping Report. The potential hazards of existing operational facilities such as COMAH sites and major accident hazard pipelines have been considered in this chapter during construction, operation and future decommissioning within Risk Event 13. The ES stage will include more detailed hazard analysis such as QRA and consequence modelling which can be used to refine the assessment of potential domino effects. Assessment by HSE as part of the Hazardous Substance Consent application.
	The proposal laid out in the EIA recognises the operation of the will involve the presence of hazardous substances on, over or under land at or above set threshold quantities (Controlled Quantities) will therefore require Hazardous Substances Consent (HSC) under the Planning (Hazardous Substances) Act 1990 as amended, as set out in The Planning (Hazardous Substances) Regulations 2015 as amended (Ref 22-7). Table 21.3 of the EIA recognises that HSC would be required given the proposal involves the handling of Named Hazardous Substances or Categories of Substances at or above the controlled quantities set out in Schedule 1 of these Regulations. The proposal also recognises the site will be within the scope of Control of Major Accident Hazard Regulations 2015 and will therefore require notification to the COMAH Competent Authority prior to construction. However, what is not identified in this table is whether notification is required under the Pipelines Safety Regulations 1996 in relation to the construction and	This PEI Report MA&D chapter includes additional details on the requirement for the Project to comply with the Pipelines Safety Regulations (PSR) 1996 (Ref 22-6) which are relevant to the Project. Pipelines containing hydrogen and ammonia are within the definition of dangerous substances contained within the PSR, therefore specific controls described in PSR will apply to these. The applicability of legislation pertinent to the assessment of MA&D within discrete areas of the Project is established in **Table 22.2**. This chapter of the PEI Report includes a statement that the operator of the pipelines would fulfil all statutory requirements for compliance with PSR 1996, including the production of a Major

Consultee	Summary of Response	How comments have been addressed in this chapter
	operation of the pipelines that are proposed within the application. It is recommended that details of the proposed pipelines and whether they come within the scope of PSR are included in future consultation documentation.	Accident Prevention Document(s) (MAPD) and the appropriate emergency plans. A description of the PSR 1996 is included in **Table 22.2** and **Section 22.4.2**.
Environment Agency	The Environment Agency will have a role in regulating the site in line with COMAH and has no comments to make on the proposed assessment for planning purposes. However, we welcome the acknowledgement that the proposed development will present major accident hazards and identifies the importance of the Humber as a receptor.	This is noted.
North East Lincolnshire Council	Thank you for the opportunity to comment on the submitted EIA Scoping report provided by the Applicant. On the whole NELC are content with the scope of the proposed EIA, responses from internal consultees are provided at the bottom of this letter. NELC would like to highlight the importance of fully understanding and considering the extent of any Hazardous Zones associated with the development and the land use planning implications of such zones. This should be through consultation with the Health and Safety Executive.	The HSE is a statutory consultee during the planning process and this consultation is expected to incorporate a detailed discussion with the Applicant around the land use planning consultation zones in the area of the Project. The Project site is within the consultation distances of a number of major hazard sites and pipelines, therefore this will be a key factor to be taken into account during the EIA for the Project and through consultation with the HSE.

Legislation, Policy and Guidance

22.2.16 **Table 22.2** presents the legislation which applies to the facilities included within the Project. The duty holder for these facilities may include operators other than the Applicant. N/A denotes the legislation is not applicable.

22.2.17 There are a considerable number of best practice guidance documents and engineering design standards applicable to the assessment of MA&Ds for the Project. Two key standards have been selected as indicative examples for preventing a loss of containment and assessment of the significance of a release to the environment should a loss occur.

Table 22.2 Relevant Legislation, Policy and Best Practice Regarding MA&D

Legislation/Policy/Guidance	Consideration within the PEI Report
The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (Ref 22-4)	
The Infrastructure Planning (EIA) Regulations 2017 require that the effects of a project, where these are likely to have a significant effect on the environment, are taken into account in the decision-making process for that project. These regulations indicate the process and requirements for the provision of adequate environmental information to enable the EIA process.	Regulation 5 - Environmental Impact Assessment (EIA) process Paragraph 4 The effects to be identified, described and assessed under paragraph (2) include, where relevant, the expected significant effects arising from the vulnerability of the proposed development to major accidents or disasters that are relevant to that development. This chapter of the PEI Report contains a description of the potential types of risk events identified as being relevant to the Project which could result in a MA&D. The IEMA guidance (Ref 22-2) defines a risk event as an identified, unplanned event, which is considered relevant to the development and has the potential to result in a major accident and/or disaster, subject to assessment of its potential to result in a significant adverse effect on an environmental receptor. A significant effect is defined as one which could include the loss of life, permanent injury and temporary or permanent destruction of an environmental receptor which cannot be restored through minor clean-up and restoration. The nature of the Project is such that there are a number of potential risk events inherent to the substances present on Site, however, the Project is required to demonstrate to the regulatory authorities that risks have been reduced to levels that are as low as reasonably practicable (ALARP) prior to the start of operational activities. This chapter therefore presents the assessment to identify risk events, categorise their significance and summarise the control and mitigation measures to reduce risk, for the purposes of the EIA process.

Legislation/Policy/Guidance	Consideration within the PEI Report
The Control of Major Accident Hazards (COMAH) Regulations 2015 (Ref 22-3)	
The COMAH Regulations 2015 (as amended) implement the Seveso III Directive and are applicable to the operators of establishments which store quantities of dangerous substances equal to or in excess of the qualifying quantities listed in Schedule 1 of the Regulations. The COMAH Regulations require that operators take all necessary measures to prevent major accidents involving dangerous substances and are enforced by the Competent Authority comprising the Health and Safety Executive (HSE) and Environment Agency (EA) acting in cooperation.	Part 2 General Duties of Operators The inventory of substances at the Project would be in excess of the qualifying quantities listed in Schedule 1 of the COMAH Regulations, therefore this legislation is applicable to the Project. Regulation 5(1) Every operator must take all measures necessary to prevent major accidents and to limit their consequences for human health and the environment. Notifications Regulation 6(1) Within a reasonable period of time prior to the start of construction of a new establishment the operator must send to the competent authority a notification containing the information set out in Regulation 6. This PEI Report contains a high-level identification of credible major accidents and disasters which will be considered as part of the ongoing programme of work to be carried out by the operator (the person in control of operations at the COMAH establishment) to demonstrate that risks associated with the Project are reduced to a level as low as reasonably practicable (ALARP), as required by the COMAH Regulations.
Land Use Planning Public Safety Advice (HSE) (Ref 22-25)	
HSE is a statutory consultee for planning applications around major hazard sites and pipelines and on applications for hazardous substances consent. HSE's advice is aimed at mitigating the effects of a major accident on the population around a major hazard site The HSE is a statutory consultee for developments which are subject to COMAH Regulations, such as this Project. Part of the consultation process will involve a review by the HSE of the site location relative to existing installations (includes COMAH sites, major accident hazard pipelines). These existing installations will have defined consultation zones. The HSE's consultation zones are categorised as either 'Inner', 'Middle' or 'Outer' and a separate category is applied for the safeguarding zones associated with explosive hazards. Within these zones, the HSE's decision making criteria are based on the type of development which is proposed within the zone, the vulnerability of those	The information contained within this chapter of the PEI Report will form part of the information and assessments undertaken by Air Products to be considered by the HSE during the statutory consultation process. Information from this Project will be considered by the HSE alongside the existing consultation zones associated with existing installations within the area. The outcome from the consultation will inform the ongoing development of the Project.

Legislation/Policy/Guidance	Consideration within the PEI Report
likely to be present within those developments and the societal tolerance of the associated risk. HSE's advice will usually depend upon: • The consultation zone within which the proposed development is located. The Inner Zone closest to the major hazard where risks and hazards are greatest and restrictions on development are strictest, the Middle Zone and the Outer Zone. The zones are normally determined by a detailed assessment of the risks and/or hazards of the installation which takes into account the quantity of hazardous substances for which hazardous substances consent is held and the details of storage and/or processing, the hazard range and consequences of major accidents involving the hazardous substances that could be present. • The "sensitivity level" of the proposed development derived from HSE's categorisation of development types. There are 4 broad sensitivity levels: level 1 – based on the normal working population; level 2 – based on the general public at home and involved in normal activities; level 3 – based on vulnerable members of the public; and level 4 – large examples of level 3 and very large outdoor developments. Other rules may apply in more complex cases, for example where the project is located in more than one zone or there is more than one hazard or development type.	
The Environmental Permitting (England and Wales) Regulations (EPR) 2016 Regulations (Ref 22-24)	
Installations which carry out one or more defined prescribed activities such as chemical manufacturing are subject to the Environmental Permitting Regulations (EPR), therefore these Regulations will apply to the Project. EPR requires operators to supply detailed information to the Regulator in the form of a Permit Application and only when fully determined, is operation allowed to commence.	The MA&D chapter of the PEI Report includes the preliminary identification of major accidents and disasters with environmental impacts. This information is summarised in **Tables 22.2** and **22.3**.

Legislation/Policy/Guidance	Consideration within the PEI Report
Operators of sites regulated by EPR are required to take the measures necessary to prevent incidents and accidents.	
The Planning (Hazardous Substances) Regulations 2015 (Ref 22-6)	
The Planning (Hazardous Substances) Regulations 2015 apply to facilities which would like to hold quantities of hazardous substances at or above defined limits within the Regulations. These facilities must obtain a Hazardous Substance Consent (HSC). Applications for HSC are made to the hazardous substance authority (usually the local planning authority and in this case, is Northeast Lincolnshire Council (NELC)). The HSE is a statutory consultee for HSC applications. These Regulations amend planning procedures in relation to sites where hazardous substances are held and to land near those sites. This consent process regulates the storage and use of hazardous substances and enables breaches of control, which may present serious risks, to be dealt with quickly and effectively. However, even after measures have been taken to prevent major accidents, there will remain the residual risk of an accident which cannot entirely be eliminated. Hazardous Substances Consent ensures that this residual risk to people in the vicinity or to the environment is taken into account before a hazardous substance is allowed to be present in a controlled quantity. The extent of this risk will depend upon where and how a hazardous substance is present, and the nature of existing and prospective uses of the application site and its surroundings.	Part 3 Hazardous Substances Consent Procedures Regulation 5(1) Subject to paragraph (2) and regulation 23 (application of the Act to hazardous substances authorities), an application for hazardous substances consent must: (d) include details of: (i) the location of the land to which the application relates; (ii) the person in control of the land to which the application relates; (iii) each hazardous substance for which consent is sought ("relevant substance"), including the maximum quantity of each relevant substance proposed to be present; (iv) the main activities carried out or proposed to be carried out on the land to which the application relates; (v) how and where each relevant substance is to be kept and used; (vi) how each relevant substance is proposed to be transported to and from the land to which the application relates; (vii) the vicinity of the land to which the application relates, where such details are relevant to the risks or consequences of a major accident; and (viii) the measures taken or proposed to be taken to limit the consequences of a major accident. The information listed in 5(d) parts (i) to (vi) is contained within **Chapter 2: The Project**. Parts (vii) and (viii) are included in this chapter, specifically **Figure 22.1** (PEI Report, Volume III) and **Section 22.7** respectively. The inventory of substances stored within the landside infrastructure areas of the Project would be in excess of the qualifying quantities listed in Schedule 1 of the Hazardous Substances Regulations, and therefore this legislation is applicable. The PEI Report therefore contains information which is expected to be included within the application for HSC to the Local Planning Authority.
Health and Safety at Work etc. Act 1974 (HSWA) and Regulations made thereunder (Ref 22-6)	

Legislation/Policy/Guidance	Consideration within the PEI Report
The HSWA is the primary legislative instrument covering workplace health and safety in Great Britain. The HSWA establishes the obligations to ensure, so far as is reasonably practicable (SFAIRP), that persons are not exposed to risks to their health and safety. The HSE, along with local authorities, are responsible for enforcing the HSWA.	Preliminary – Article 1 The provisions of this Part shall have effect with a view to— (a) Securing the health, safety and welfare of persons at work. (b) Protecting persons other than persons at work against risks to health or safety arising out of or in connection with the activities of persons at work. (c) Controlling the keeping and use of explosive or highly flammable or otherwise dangerous substances, and generally preventing the unlawful acquisition, possession and use of such substances. This chapter of the PEI Report contains a high level description of the mitigation measures proposed to manage the reasonably foreseeable identified risks to health and safety of persons working at the Project Site, in neighbouring facilities and other persons which may be affected by these operations. The mitigation measures described in this chapter include the primary containment systems for dangerous substances, such as hydrogen and ammonia, and the security systems to prevent unauthorised access to operational areas where they are present.
The Pipelines Safety Regulations (PSR) 1996 (Ref 22-6)	
The PSR, made under the Health and Safety at Work etc Act 1974, do not cover the environmental aspects of accidents arising from pipelines. However, the Regulations, by ensuring that a pipeline is designed, constructed and operated safely, provide a means of securing pipeline integrity, thereby reducing risks to the environment. It is important that effects on the environment are considered at all stages in the life cycle of a pipeline. The PSR require operators of major accident hazard (MAH) pipelines to ensure that they are designed (and subsequently modified) so that they are safe to operate within the range of operating conditions to which they will be subjected. Safety systems such as emergency isolation and pressure relief valves will be provided to secure safe operation. Specific emergency plans are required for the pipelines and a Major Accident Prevention Document (MAPD) is to be	This Project would include installation of pipelines connecting the two operational process areas and these areas to the jetty, crossing land which is not owned and under the control of the Applicant and therefore the PSR will apply. These pipelines would transport hydrogen and ammonia, consequently, these are categorised as MAH pipelines within the PSR. A further pipeline would transport nitrogen between the East and West Sites. Gaseous nitrogen is not classified as a dangerous fluid in accordance with regulation 18(2) and Schedule 2 of the PSR, therefore is not categorised as a MAH pipeline. This chapter of the PEI Report establishes the principles to be adopted by the Project to comply with these Regulations, including identification and management of the risks associated with their operation.

Legislation/Policy/Guidance	Consideration within the PEI Report
produced, describing the hazards and safety management systems associated with management of risk. Operators are required to notify the HSE in advance of construction of a MAH pipeline and operations commencing.	
Construction (Design and Management) (CDM) 2015 Regulations (Ref 22-8)	
The CDM Regulations place specific duties on those undertaking defined roles during construction activities, such as clients, designers and contractors. These duties are to ensure health and safety is managed throughout the life of a construction project.	The CDM Regulations apply specific requirements for the management of health and safety during construction projects. This chapter of the PEI Report includes certain general overarching principles of how the Project will comply with CDM, to manage risks which have the potential to be a major accident, such as the development of a Construction Environmental Management Plan (CEMP).
The Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) 2002 (Ref 22-9)	
DSEAR set out the minimum requirements for the protection of workers from fire and explosion risks related to dangerous substances and potentially explosive atmospheres. These Regulations apply to employers at workplaces in Great Britain where a dangerous substance such as hydrogen is present or could be present. For COMAH Installations such as the Project, DSEAR is enforced by the HSE. Compliance with DSEAR requires employers to assess and control risks and ensure safety measures are in place before beginning work activities. Areas where an explosive atmosphere may be present must be identified, and can include tank vents, around flanged connections in pipework and many others. New equipment supplied for use in places where an explosive atmosphere may occur must meet the requirements established by DSEAR to prevent a source of ignition becoming active and available, thus increasing the risk of fire and/ or explosion.	The substances which would be present at the Project Site include hydrogen, ammonia and natural gas which are categorised in these regulations as dangerous, therefore the DSEAR is applicable. Mitigation measures to reduce the risk of MA&D events such as fire, explosion and toxic gas release include activities carried out for the purposes of DSEAR compliance. These activities would be undertaken throughout the lifecycle of the Project, from an early stage in the engineering design process where explosive atmospheres would be identified, and equipment (mechanical and electrical) would be specified appropriately. DSEAR compliance during construction includes assessments for the safe use of diesel which is classified as a flammable fluid within mobile plant. During Project operation and maintenance activities, detailed risk assessments would be completed, documented and regularly updated to reflect any changes made on site. These risk assessments would demonstrate a robust basis of safety for operation of the site as required by DSEAR.

Legislation/Policy/Guidance	Consideration within the PEI Report
The Chemical and Downstream Oil Industries Forum (CDOIF) Guideline on Environmental Risk Tolerability for COMAH Establishments (Ref 22-10)	
The COMAH Competent Authority recognizes the CDOIF Guideline on Risk Tolerability at COMAH Establishments as providing an appropriate methodology to Operators completing their Safety Reports. These reports must include an assessment of the environmental consequences (extent, severity and duration) of potential accidents, to determine whether the effects might constitute a Major Accident to the Environment (MATTE). The CDOIF guideline methodology includes a structured approach to assessing environmental risks following major accidents, taking into consideration the extent (the area / distance), the severity (the degree of harm within the area of impact), and duration (the recovery period) of the event. The levels of harm to the environment which would be categorised as serious depends on the type of receptor, therefore this methodology includes threshold harm levels specific to categories of receptor e.g., groundwater and soils. Risk is evaluated taking into consideration the severity and duration of the event, and a category of MATTE can be concluded. These risk categories are A (lowest) to D (highest). Risks identified as being below category A are termed 'sub-MATTE' and can be screened out of further assessment. For each MATTE event identified, the CDOIF guidance presents frequency limits to identify events which can be categorised as 'intolerable' or 'broadly acceptable'. Where risks are classed as intolerable, Operators must take additional measures to reduce risk.	Operators of COMAH sites such as the Project recognise the CDOIF methodology as providing best practice for environmental risk assessment (ERA). An ERA is typically undertaken following or alongside the engineering design process prior to operation, to support the development of the COMAH Safety Report. However, this methodology is focused on oil and chemicals/hazardous liquids and not industrial gases processes and was not developed in consultation with the industrial gases industry, so will need be used with caution in this context. The measures to prevent and mitigate the consequences of MA&Ds include undertaking an ERA to support COMAH compliance and demonstrate that all measures necessary have been taken to prevent major accident hazards. The output of the ERA provides guidance to operators on the suitability of their installed systems such as bunding and containment, to prevent an accidental release reaching the environment. Consequently, a robust ERA employing the CDOIF methodology is listed as a mitigation measure in **Section 22.7**.
British Standard (BS) 61508 (Ref 22-11) **/ 61511** (Ref 22-12) **Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems**	
Functional safety is a term used to describe engineering assessments and systems to reduce the risk to people and the	Operators of COMAH sites such as the Project recognise these standards as providing best practice in the engineering design of process facilities and the specification of SIS Safety Instrumented Functions and

Legislation/Policy/Guidance	Consideration within the PEI Report
environment from process operations via the use of automatic protection functions. COMAH Installations typically employ functional safety within Safety Instrumented Systems (SIS), which provide control functions for process operations. SIS incorporate devices such as automatic high pressure and low pressure trips, the purpose of which is to return a process operation to a safe condition if a deviation occurs, without the need to an operator in a control room to take action. SIS incorporate computer controlled functions to monitor process conditions and are connected to devices such as valves, which open or close automatically in response to a computer signal. The reliability of SIS is important to the safe operation of the Project's process facilities. The means of demonstrating an appropriate level of reliability can be achieved is established in a series of standards developed by the International Electrotechnical Commission (IEC) and published by the British Standards Institution (BS). BS 61508 is a basic functional safety standard applicable to all industries and BS 61511 is specific guidance for the process industries as well as implementing Safety Instrumented Functions and safety lifecycle process in accordance with IEC61511. These guidance documents are recognised by the Competent Authority as representing best practice for functional safety.	safety lifecycle process in accordance with IEC 61511, which are important to prevent a loss of containment occurring from process systems which could lead to an accident. These standards are a key mitigation measure in the prevention of a number of risk events, such as fire, explosion and toxic release which are noted in **Section 22.7**.

22.2.18 **Table 22.3** presents the legislation which applies to the facilities included within the Project. The duty holder for these facilities may include operators other than the Applicant. N/A denotes the legislation is not applicable.

22.2.19 An application for Hazardous Substances Consent will be submitted to NELC shortly.

22.2.20 Formal notification to the HSE would be required prior to Project construction for compliance with the COMAH and PSR. An additional notification is required prior to operation.

Table 22.3 Applicability of Legislation to Project Facilities and Areas

Project Facility/ Area	COMAH Regulations	Hazardous Substances Consent	Pipelines Safety Regulations	DML MMO
Ships in Transit	N/A	N/A	N/A	Applicable in English waters
Ships in Port	N/A	N/A	N/A	Applicable
Pipelines on Jetty Trestle	N/A	N/A	Applicable	Applicable
Terrestrial Pipelines (Connecting Process Facilities to Jetty)	N/A	N/A	Applicable	N/A
Process Facilities (inc. Hydrogen and Ammonia Storage)	Applicable	Applicable	N/A	N/A

22.2.21 A key aspect of the COMAH Regulations and Hazardous Substances Consent Regulations is the control of certain types of new development, such as the Project, in order to maintain adequate separation from residential areas, buildings and areas of public use around major hazards when the development increases the risk or consequences of a major accident. Any new development should not significantly worsen the situation should a major accident occur. The HSE is a statutory consultee during the planning and Hazardous Substance Consent process and is responsible for advising whether the risks associated with a new development such as the Project are at an acceptable level. This decision making process includes the use of criteria referred to as 'Consultation Distances' which are zones (often referred to as land use planning zones) established by the HSE around major accident hazard sites and pipelines for planning control.

22.2.22 The HSE's Consultation zones are categorised as either 'Inner', 'Middle' or 'Outer' and a separate category is applied for the safeguarding zones associated with explosive hazards. Within these zones, the HSE's decision making criteria are based on the type of development which is proposed within the zone, the vulnerability of those likely to be present and the societal tolerance of the associated risk. The Inner Zone is closest to the major hazard where risks and hazards are greatest and restrictions on development are strictest. A full description of these zones is found at HSE: Land Use Planning (Ref 22-25). The operator will still need to ensure that the overall risk of a major accident is reduced to as low as reasonably practicable.

22.2.23 The methodology used by HSE when providing land use planning advice is based on the following principles:

a. The risk considered is the residual risk which remains after all reasonably practicable preventative measures have been taken to ensure compliance

with the requirements of the Health and Safety at Work etc. Act 1974 and its relevant statutory provisions.

b. Where it is beneficial to do so, advice takes account of risk as well as hazard, that is the likelihood of an accident as well as its consequences.

c. Account is taken of the size and nature of the proposed development, the inherent vulnerability of the exposed population and the ease of evacuation or other emergency procedures for the type of development proposed. Some categories of development (e.g. schools and hospitals) are regarded as more sensitive than others (e.g. light industrial), and advice is weighed accordingly.

d. Consideration is given to the risk of serious injury, including that of fatality, attaching weight to the risk where a proposed development might result in a large number of casualties in the event of an accident.

22.2.24 The Project is within the consultation distances of a number of major hazard sites and pipelines; therefore this will be a key factor to be taken into account during the Project design and planning. An application for hazardous substances consent has been submitted to NELC in connection with the hydrogen production facility.

22.2.25 The land use planning zones are likely to impact the seven residential properties located on the west side of Queens Road which are included within the Site boundary. Once the hydrogen production facility on the West Site is fully operational, it is likely that these properties will fall within or close to the Inner Zone associated with the operational Project. Further design work and consultation with the HSE are being undertaken relating to the consultation zones for the Project.

22.2.26 It is currently anticipated that the continued residential use of those properties is unlikely to be compatible with the operation of the hydrogen production facility on the West Site and will need to cease. Discussions have commenced with the owners and occupiers with a view to negotiating their acquisition. Where it is not possible to acquire those properties through negotiation, acquisition powers for these properties will be sought through the DCO.

22.2.27 As defined in **Chapter 2: The Project**, a number of businesses are also present in the same area on the west side of Queens Road. It is likely that the ongoing operation of those businesses will be compatible with the operation of the hydrogen production facility. As part of HSE advice on the hazardous substance consent application, the HSE will determine if there are relevant impacts on these businesses. Whilst it is possible that powers to compulsorily acquire the properties or undertake appropriate works may be sought as part of the DCO, this is currently considered unlikely.

Limitations and Assumptions

22.2.28 This preliminary assessment has identified the credible, worst-case Risk Events relevant to the Project. The risk of these events is required to be reduced to a level demonstrated to be ALARP by the design and operation of the facilities. At this stage in the Project design the facilities have not yet been fully specified, therefore standard industry approaches to managing risk which are typically

adopted at COMAH installations will be assumed. These are covered in detail in **Table 22.5**

22.2.29 The assessment has been based on the hazardous substances expected to be present on site during the construction and operational phases. The quantities of these substances are likely to vary during the Project's development, as the terrestrial phases of the green hydrogen production facility is expanded and built out, although the means of storage and transport would not be expected to vary.

22.2.30 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further through the assessment and consultation processes, and as further research and investigative surveys are completed to fully understand its potential effects. Further assessments will be reported in the ES.

Study Area

22.2.31 The extent of the study area for the assessment of MA&Ds is not defined within regulatory guidance or standardised methodology, therefore an area defined by a radius of 5km from the Site boundary has been applied. The extent of this study area is based on experience and professional judgement, taking into consideration the proximity of the Project to protected environmental receptors such as the Humber Estuary, industrial sites which include the Humberside cluster of COMAH installations and MAH pipelines, and the residential area of Immingham. These receptors are all within a 5km radius of the Project Site. Expanding the study area to a wider radius such as 10km would not be expected to introduce new categories of receptor or more sensitive receptors to the assessment.

22.2.32 The study area is shown in **Figure 22.1** (PEI Report, Volume III) and identifies nearby major hazard sites, pipelines, and other sites whose land use planning zones may encroach on any part of the Project.

22.2.33 There have been minor changes to the Project boundary and therefore the study area for MA&D since the publication of the Scoping Report (**Appendix 1.A** of PEI Report Volume IV). These changes have made no appreciable impact on the study area or the assessment of MA&D.

22.3 Summary of Assessment Methodology

22.3.1 The assessment of MA&Ds undertaken within this PEI Report involves the following steps, which are the same as outlined within the Scoping Report. The assessment steps are summarised as follows:

a. Collation and review of baseline information pertaining to the hazardous properties of the substances (and their consequences) which are expected to be present during the construction and operation of the Project. The hazardous properties of the substances is informed by their classification in accordance with the Classification, Labelling and Packaging (CLP) Regulations (Ref 22-1813).

b. Identification of hazards and threats based on the concept design work completed to date and in accordance with industry standard approaches to hazard identification.

c. The determination of the study area and assessment of the Project's location in relation to the sensitivity of the environment and the potential for natural disasters, such as meteorological hazards, seismic events and climate change impacts was initially considered within the Scoping Report.

d. The conclusions of this scoping assessment were that certain natural disasters would not be credible MA&D scenarios; however this has been reassessed within the PEI Report. The meteorological hazards assessed include the following:

- Flooding following heavy rainfall events (including fluvial, surface water, groundwater, river and sewer flooding).
- Storms and high wind speeds.
- Drought, heatwave and extreme humidity.
- Extreme cold and snow conditions.
- Lightning and electrical storms.
- Reduced visibility, such as severe fog.

e. An assessment of the potential impacts to and from neighbouring industrial facilities, which includes sites regulated by the COMAH Regulations (Ref 22-3) and PSR (Ref 22-6) i.e. the consideration of the local cluster of industrial sites.

f. Screening of hazards and threats, including the likely significant effects.

g. Assessment of the potential magnitude of impacts that result from credible scenarios, to identify those which may be significant and within the criteria benchmark for a MA&D. The output is a schedule of Risk Events, for which mitigation measures are to be considered.

h. For credible MA&D scenarios, measures to prevent, minimise and/or mitigate risk are outlined in this preliminary assessment and will be further defined, so far as is possible in the ES. Embedded mitigation measures include engineering design by using industry standards, procedural controls and maintenance, fire and gas detection, fire protection and others.

i. Following consideration of the outlined mitigation measures, the residual risks are identified, and a conclusion reached on the tolerability and significance of the residual risks to determine if risks have been reduced to ALARP.

22.3.2 The conclusions of the MA&Ds chapter are a qualitative assessment of the significance of identified foreseeable credible events and the residual risks after mitigation measures are taken into account. Risk management will be part of an ongoing process throughout the lifecycle of the Project and a requirement for compliance with applicable legislation including COMAH, Environmental Permitting, Hazardous Substances and PSR, for example:

a. Operators of COMAH installations are required to demonstrate within a Safety Report that the risks associated with the facility have been comprehensively assessed and a conclusion has been reached on the tolerability of risk, including the sufficiency of measures to ensure risk is

reduced to ALARP. It is a regulatory requirement that all measures necessary must be taken to reduce risk at COMAH installations and Safety Reports must be updated and resubmitted to the Competent Authority, comprising of the HSE and EA for review every five years.

b. Installations which carry out one or more defined prescribed activities are subject to the Environmental Permitting Regulations (EPR), which will apply to the Project. This legislation requires operators to supply detailed information to the Regulator in the form of a Permit Application and only when fully determined and the relevant environmental permit granted, is operation allowed to commence. Compliance with EPR requires operators to regularly submit information and data such as emissions monitoring results to the Regulator to confirm the Site is operating within permitted limits (as set out in the environmental permit).

c. The Hazardous Substances Regulations require operators to assess the inventory of defined hazardous substances which could be present at the Site against controlled quantities. If the inventory exceeds the controlled quantities, operators are required to obtain a Hazardous Substances Consent. An application is made to the Hazardous Substance Authority (normally the local planning authority) which is responsible for enforcement. The application must include a description of substances, operations and the identification of the hazards associated with the Site and relevant safety information. For the Project, an application for the Hazardous Substances Consent for the Project is being submitted to North East Lincolnshire Council (NELC) shortly.

d. Compliance with PSR requires operators to operate in accordance with a defined Safety Management System (SMS) for the pipeline(s) which includes the production of a Major Accident Prevention Document (MAPD). This document must be developed during design to incorporate means to demonstrate that the risks of identified hazards have been evaluated and appropriately managed via means such as inspection. PSR requires performance standards to be established and safety information regularly audited.

22.4 Baseline Conditions

Overview

22.4.1 The current baseline environment for the consideration of MA&Ds has been established through a review of existing information sources. Within the study area shown in **Figure 22.1** (PEI Report, Volume III), industrial facilities are present which are regulated as major accident hazard establishments through the COMAH Regulations (Ref 22-3), as well as major accident hazard pipelines regulated in accordance with the PSR (Ref 22-6). These installations and their corresponding hazards are therefore important factors under consideration as part of the ongoing development of the Project design, in discussion with key stakeholders such as the regulatory authorities, including the HSE and EA.

Existing Baseline - Infrastructure and Industrial Sites

22.4.2 The industrial area of Immingham contains a number of upper tier COMAH sites which are regulated in accordance with the COMAH Regulations (Ref 22-3). The numbering of sites [#] corresponds to the location as identified within **Figure 22.1** (PEI Report, Volume III):

a. [1] The Humber Refinery operated by Phillips 66 is located approximately 4 km in a westerly direction from the Project Site and processes crude oil to produce gasoline, diesel and aviation fuels as primary products.

b. [2] The Lindsay Oil Refinery operated by Prax Ltd is located approximately 5 km in a westerly direction from the Project Site and undertakes similar operations to the Humber Refinery.

c. [3] The Humber LPG Terminal and underground gas storage caverns also operated by Phillips 66 Ltd, located approximately 4 km from the Project Site in a westerly direction.

d. [4] Immingham Docks operated by ABP which comprises a number of discrete operational areas, some of which are COMAH Installations. These facilities store commodities including bulk fuels and fertilizer and include:

   i [4a] Immingham Oil Terminal operated by Associated Petroleum Terminals (APT), directly adjacent to the Project Site.

   ii Exolum Immingham Limited (formerly Inter Terminals Ltd) located 1.5 km (east terminal [4b]) and 2 km (west terminal [4c]) in a westerly direction from the Project Site.

e. [5] Tronox Pigment UK Ltd operate a chemical manufacturing facility located approximately 1 km south-east of the Project Site.

f. [6] Air Products operate a facility for the manufacture and storage of industrial gases including oxygen and nitrogen which is located approximately 1.5 km from the Project Site in an easterly direction.

g. [7] BOC operate a facility for specialty gas manufacturing and storage operations, located approximately 2 km south-east of the Project Site.

h. [8] The South Humber Bank Power Station owned by EP UK Ltd which is a combined cycle gas turbine (CCGT) facility supplied by a high pressure gas pipeline, located approximately 2.5 km south-east of the Project Site.

i. [9] Synthomer Ltd operate a chemical manufacturing facility, producing substances such as adhesives and coatings. Location is approximately 2.5 km south-east the Project Site.

22.4.3 The major accident hazard pipelines located in the study area are used to transport gas and petroleum products. These include a high-pressure gas pipeline operated by National Grid located approximately 4 km from the Site, in a south-easterly direction, routed to the South Humber Bank Power Station [8]. National Grid also operate 400 kV overhead electrical power distribution systems in the vicinity of the Site boundary.

22.4.4 There are no major airports located within the vicinity of the Project, the closest airport being Humberside which is located approximately 12 km in a south-

westerly direction. This airport is used for short haul chartered and scheduled flights, including helicopter flights to offshore installations in the southern North Sea. The flight path for these services and other routes crosses the industrial area of Immingham and the Humber Estuary.

22.4.5 In addition to the major accident hazard sites and pipelines, the baseline area consists of critical road, rail and seaport infrastructure and is an important industrial area within the UK. The Port of Immingham [4] currently handles thousands of ship movements per year, including the import of significant quantities of liquid and gaseous fuels. The Port of Immingham is located directly adjacent to the Project, and comprises loading and offloading jetties, bulk storage tanks for hydrocarbon liquids and fertiliser storage. Subterranean caverns [3] for the storage of liquefied petroleum gas (LPG) are located approximately 3.5 km in a westerly direction from the Project.

Existing Baseline – Natural Features and Protected Environmental Sites

22.4.6 The potentially credible disaster scenarios relevant to the Project are largely dependent on the existing natural features and proximity of protected environmental sites/receptors.

22.4.7 The UK experiences very low levels of seismic activity and there are no significant seismic events recorded by the British Geological Survey (BGS) for the Humberside region at the nearest seismic monitoring location which is sited approximately 10 km south of Humberside Airport.

22.4.8 The Humber Estuary [10] is classified as a Special Protection Area and is a designated Ramsar Site. The estuary is directly adjacent to the Project and contains areas which are designated as Special Areas of Conservation (SAC) and Sites of Special Scientific Interest (SSSI). The wetland areas of the estuary support internationally important numbers of waterfowl in the winter, including golden plovers, and hosts the second largest colony of grey seals in the UK. An incident which has an impact on these receptors could satisfy the criteria for a disaster, and therefore requires consideration.

22.4.9 The bedrock groundwater within the Site boundary is designated as a principal aquifer via the BGS and EA classification system. This designation corresponds with the most important type of groundwater which supports drinking water supplies and ecosystems. Potential impacts to groundwater are considered within the assessment of Risk Events.

22.4.10 The Humber Estuary is tidal and situated on low-lying land, therefore at risk of tidal flooding. Significant investment has been made in flood defences for this area; however continued efforts are required to combat the potential impacts of climate change. Currently, the flood risk level defined by the EA in the area of the Project is Low to Medium from rivers and the sea, therefore the potential impact of flooding on the Project is considered in this assessment.

22.4.11 Climate change resilience is being incorporated in the design of the Project as necessary. The expectations of the COMAH Competent Authority (being the HSE and the EA) are that operators will include an assessment to identify and assess Major Accidents to the Environment (MATTE) within their Safety Report for the Project. MATTE could include those initiated by climate change consequences,

e.g.: rising river levels. The assessment of MATTEs will contain information on how natural events could directly or indirectly cause a MATTE. Best practice for the methodology to carry out this assessment is provided within the CDOIF Guidance, described in **Table 22.2**.

22.4.12 There are no World Heritage Sites, Scheduled Monuments, Grade I and II listed buildings, conservation areas, registered parks and gardens, registered battlefields, or protected wreck sites within the 2km study area for designated heritage assets. A detailed assessment of heritage sites is contained in **Chapters 14: Historic Environment (Terrestrial) and Chapter 15: Historic Environment (Marine)** of the PEI Report.

Existing Baseline – Human Health and Safety

22.4.13 Immingham is the nearest town to the Project and has a population of around 11,728, located approximately 1.5 km in a south-westerly direction. The conurbations of Grimsby (southeast) and Hull (north-west) have populations of around 86,105 and 287,705 respectively.

22.4.14 The closest residential premises to the Project are located on the west side of Queens Road within the western side of the Site and these are listed in **Chapter 2: The Project.** A large number of residential properties are also located approximately 500m to the west of the Site boundary on the eastern edge of the town of Immingham.

22.4.15 Population and human health receptors include persons present on site during construction and operation as well as the greater external population. Persons present on neighbouring industrial facilities have also been taken into consideration. Off-site sensitive receptors include vulnerable locations such as hospitals, care homes and schools, of which there are a number within the town of Immingham but none closer than 3.5km from the Site. The nearest such sensitive receptor is the Immingham Day Nursery [11].

Future Baseline - Infrastructure and Industrial Sites

22.4.16 The future baseline of the area may include potential new developments located in and around the areas of Immingham, North and South Killinghome and Stallingborough. The Immingham Eastern Ro-Ro Terminal (IERRT) is a development currently going through a separate Development Consent Order (DCO) process and is associated with the development of the Port of Immingham. This facility would primarily service commercial cargo, with some use by passengers (members of the public) and involve construction and operation of marine and landside infrastructure. Further details are contained within **Chapter 25: Cumulative and In-Combination Effects.**

22.4.17 The nature of the area around Immingham provides an attractive location for major projects and therefore the additional industrial developments could be brought forward in future.

22.5 Project Design and Impact Avoidance

22.5.1 The following impact avoidance measures will either be specific measures incorporated into the Project design or are standard construction or operational

measures, typically included within similar industrial developments and it can be assumed that these will be incorporated into the Project. These measures have therefore been taken into account during the impact assessment process described in this chapter.

Design

22.5.2 During the Project design process, a number of philosophies with regard to process safety and safeguarding, isolation, emergency shutdown, and if required, depressurisation will be developed. The Project design process will also involve reviews of the layout and give due consideration both to the on-Site facilities design as well as the off-Site receptors. A design hazard management plan will be prepared, and a number of hazard identification (HAZID), Hazard and Operability (HAZOP) and other risk assessments have been and will continue to be carried out during the design process. This is a standard approach to the engineering design of industrial facilities which has been used for decades in the processing industries worldwide. The objective of these assessments is to identify, prevent or minimise hazardous scenarios through appropriate design during the Front End Engineering Design (FEED) studies which are to be progressed. Major accident assessments and technical studies will be undertaken over the course of the design development as required. A Major Accident Prevention Plan (MAPP) for the Site will be prepared to support the notification to the HSE of the green hydrogen production facility (the Associated Development) as a COMAH installation and a MAPD will also be developed for the pipelines.

22.5.3 CDM regulations (Ref 22-8) will be followed as required throughout the design phase.

Construction

22.5.4 Formal risk assessments to identify potential hazards during construction (HAZCON) are typically carried out prior to completion of the design phase for process facilities such as the Project. This study is similar to formal process safety studies such as HAZID and HAZOP, in that it is a structured review based on guidewords, employing a multi-disciplinary team of specialists led by an experienced facilitator.

22.5.5 The use of suitably experienced contractors, risk assessments, working method statements, operating procedures and personnel training minimise the risk of accidental scenarios occurring during construction of the Project.

22.5.6 An Outline Construction Environmental Management Plan (CEMP) would be prepared to set out how construction activities would be managed and controlled in compliance with accredited health and safety and environmental management systems, relevant legislation and environmental permits, consents and licences. An Outline CEMP will be produced in support of the Application and will set out the key measures to be employed during construction of the Proposed Development to control and minimise impacts on the environment. A Requirement of the DCO would ensure that the contractor's CEMP must be in accordance with the principles set out in the Outline CEMP.

Operation

22.5.7 As outlined previously, Hazardous Substances Consent issued by the local authority, a COMAH Safety Report and pipelines MAPD approved by the HSE, and an Environmental Permit issued by the EA would be required for the operation of the Project facilities. These consents and documents require a number of stipulations and requirements to be fulfilled to the satisfaction of the regulators, including the use of appropriate control and monitoring procedures, risk assessments, management systems and control measures to minimise the risk of accidents occurring and to minimise the effects of any such accidents on off-site receptors as well as the operational workforce. The Environmental Permit would require the approach to managing accidents and emergencies to be in accordance with the use of Best Available Techniques (BAT).

Decommissioning of the hydrogen production facility

22.5.8 Similarly with construction and operation, formal process safety studies and risk assessments would be carried out to identify potential hazards prior to decommissioning and demolition of the hydrogen production facility. These studies would be carried out in accordance with industry best practice such as HAZDEM. These studies typically employ a team of specialists to identify potential hazards, consider the associated risks and specify the appropriate mitigation and control measures required. As explained in **Chapter 2: The Project**, the jetty, which comprises the Nationally Significant Infrastructure Project (NSIP), would not be decommissioned, as it would become part of the port infrastructure and would be maintained and refurbished as necessary in accordance with this status.

22.6 Potential Impacts and Effects

22.6.1 This section describes the hazardous properties of the substances which would be present on site during the lifecycle of the Project and potentially hazardous activities which have the potential to be a credible major accident scenario.

Construction

22.6.2 The potentially harmful substances which would be present during the construction phase include liquid cement and diesel fuel oil.

22.6.3 Cement and mixed liquid concrete is classified as an irritant to skin as contact can cause alkali burns. This substance can harm the eyes and the respiratory system via inhalation of dust and if cement or wet concrete enters drains or watercourses, there is the potential to cause harm to the environment via an increase in the pH of water.

22.6.4 Diesel is likely be used within mobile power generators, construction plant and construction vehicles, even if it is possible that some of the construction plant and vehicles will use alternative power sources. This substance is classified as a flammable liquid and harmful to the aquatic environment. A release which is ignited could cause harm to people via exposure to thermal radiation in a fire, or if unignited, diesel can cause harm to people if inhaled, ingested or exposed to skin. A release of diesel to the environment such as the Humber could result in harm to flora and fauna.

22.6.5 Construction work can include potentially hazardous activities such as working near to overhead power supplies or buried services such as power cables and gas transmission mains. Accidents have occurred historically due to contact with high voltage (HV) electricity supplies, the collapse of excavations and structures during construction which have resulted in fatal injuries to workers on Site.

Operation

22.6.6 When operational, the terminal would receive consignments of liquefied refrigerated ammonia delivered via ship to the offloading jetty, where it would be transferred for storage in tanks onshore prior to use. Hydrogen gas would then be produced by the dissociation of ammonia within process operations using the hydrogen production units described in **Chapter 2: The Project**. The hydrogen gas would then be cooled and liquefied prior to filling into bulk road tankers for delivery to end users.

22.6.7 Utility services supporting hydrogen production operations would include compressed air, nitrogen, natural gas (used as a source of energy, at least in the initial stages of the Project) and electrical power supplies. Cooling water would also be used, which would be circulated in a closed loop through the process with a purge stream to maintain water quality. Process wastewater would be treated on Site prior to discharge to the local sewerage system. Water would also be stored for the purposes of firefighting. Small quantities of substances such as biocides and scale inhibitor would be used to treat water on Site for use in the process, and while these substances can be categorised as dangerous to humans and the environment, the quantities used on Site are expected to be small.

22.6.8 Refrigerated anhydrous ammonia is classified as a flammable gas and if released can form explosive mixtures in air if in confined spaces , ammonia does not sustain combustion. Ammonia is toxic if inhaled and causes severe skin burns, eye damage and respiratory irritation and can be damaging to flora and fauna .

22.6.9 Ammonia is toxic to the environment if released to water and is incompatible with certain substances, such as oxidants e.g. sodium hypochlorite (bleach), which reacts with ammonia to release chlorine gas. No ammonia incompatible substances would be present in significant quantities on Site.

22.6.10 The most common cause of injuries to people associated with ammonia are as a result of gas inhalation. Serious incidents involving ammonia are rare events, when considering the very large number of operating hours of facilities handling ammonia in continual industrial processes. If they do occur, extensive investigations are carried out to identify lessons which can be learned to improve safety within industrial usage. Examples of such incidents include the ammonia release at a Petronas facility in Malaysia (Ref 22-14) and the Medicine Hat facility in Canada (Ref 22-15).

22.6.11 Hydrogen is an extremely flammable gas, with a wide flammable range (4% to 77% by volume) and can form explosive mixtures in air. The hazardous properties of hydrogen are well understood by industrial operators and there is a substantial body of safety regulation and industry guidance associated with the equipment used to store and use this material. An example of an incident

involving a release of hydrogen is the explosion at a chemical manufacturing facility in Illinois in 2019 (Ref 22-16).

22.6.12 Natural gas used as a source of fuel for the hydrogen production units is classified as extremely flammable and can form explosive mixtures in air. The consequences of a loss of containment of natural gas would be substantially similar to hydrogen, however the quantity of hydrogen would be substantially greater than natural gas, if a release were to occur. Legislative controls and engineering standards for equipment and pipework design and other mitigation measures to reduce risk are very closely aligned with those for hydrogen and consequently this assessment focuses on hydrogen as the primary flammable gas.

22.6.13 When in operation, the jetty and associated facilities may be used to import and export CO_2 as a bulk liquid from carbon capture and storage installations. This system would be subject to a separate application for consent with corresponding assessment of MA&D, and therefore are not included within this assessment.

22.6.14 Small quantities of substances such as mineral and synthetic lubricating and hydraulic oils would be used for equipment on Site with moving parts, such as pumps and compressors. These fluids are not generally categorised as hazardous, and are of low flammability but are combustible in the event of a fire and may cause harm to the environment if released to water. The quantity of these materials is, however, expected to be small and would typically be stored in containers not exceeding 1,000 litres capacity as well as water treatment chemicals including small qualities of acid, hypochlorite and biocides which would be stored in bunded containers.

22.6.15 Process operations would include hazardous activities by virtue of the dangerous substances present on Site. A robust safety management system (SMS) is a requirement of the COMAH Regulations and would be in place prior to operation to ensure operational risks are reduced to ALARP.

Jetty and Marine Operations

22.6.16 The vessels used to deliver refrigerated ammonia would be VLGCs. In order to assess a worst case and particularly in relation to the climate change considerations (see **Chapter 19: Climate Change**), it is assumed that the VLGCs, would initially be powered by marine fuel oil (MFO) which is a liquid hydrocarbon mixture similar to diesel fuel. If released, MFO is toxic to the aquatic environment, it is classified as a flammable liquid and vapour and is harmful to people. In the longer term, it is anticipated that the existing VLGC fleet for ammonia imports would be replaced by a fleet powered by sustainable low carbon fuels. Over the long term, a similar transition can be expected across the marine fleet, to include similar vessels in the carbon capture sector which are expected to use the new terminal.

22.6.17 VLGC vessels would contain ballast water which provides stability. This water can be contaminated with biological material such as pathogens native to the water of the country of origin of the delivery vessel. The vessel would also contain grey water from washing and black water from toilet facilities. If released to the Humber, these waste waters could be harmful to the environment.

22.6.18 Jetty loading/offloading systems typically contain hydraulic oils, which are synthetic, non-flammable fluids. If released to water, these could potentially cause harm by forming a film on the surface which inhibits oxygen transfer. The quantities of hydraulic fluids present in the systems would be small and any release would be considered trivial and an accidental release would be unlikely to reach the criteria for a potential major accident to the environment. Control of pollution during the operational phase of the Project is covered further in **Chapter 17: Marine Water and Sediment Quality** and **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage**.

22.6.19 The operational activities carried out at the jetty and the VLGC would, in relation the green hydrogen production facility, primarily be offloading of refrigerated ammonia. This would be undertaken in a substantially similar manner to the loading and offloading of hazardous gases undertaken for many years at the Port of Immingham, in accordance with established safety procedures.

Demolition of the hydrogen production facility

22.6.20 The hazards associated with activities carried out during demolition are substantially the same as construction, however, as the process equipment and pipework have contained dangerous substances, additional safety precautions are required. These include gas purging, venting and cleaning processes and catalyst removal to ensure no hazardous substances remain prior to dismantling and demolition.

22.6.21 **Table 22.4** presents the results of the assessment of the hazardous properties of substances and activities, geographic location of the Project and the baseline study area, to identify credible MA&Ds scenarios, termed Risk Events. Further analysis of risk events will be undertaken to support the COMAH Safety Report and relevant Safety Case(s).

Table 22.4 Identification of Major Accident & Disaster Categories

Ref.	Hazard Category	Impact/Receptor	Credible MA&D
Construction Activities Credible hazard categories associated with construction activities include accidental damage to existing service infrastructure such as electrical power, gas and oil pipelines. Consequences of such incidents generally depend on the extent of contact made and proximity of people and sensitive receptors.			
1	Release of Raw Materials used in Construction Activities A release of construction materials e.g. liquid concrete, diesel (used for power generation). Potential for minor harm to people if exposed to liquid cement, and/or diesel. Potential for minor harm if substances released to environment (due to quantities likely to be released).	Potential minor impact to human health (on-site workers) and environmental receptors on Site.	No

Ref.	Hazard Category	Impact/Receptor	Credible MA&D
2	Construction Activities – Electrical Systems Strike Impact with overhead electrical transmission system e.g. crane impact on high voltage (HV) electrical cable or underground cable strike during excavation. Potential for harm to people including fatal injuries. Potential interruption to local electrical power supplies.	Potential significant impact to human health on Site. Interruption to local power supplies.	Yes Risk Event 1
3	Construction Activities – Underground Gas Main/UXO Strike Impact with underground gas main during excavation activities. Potential for unexploded ordnance (UXO) on the Project Site. Potential for a significant release of gas leading to fire and/or explosion, with harm to people including potential for fatal injuries. Potential explosion in event of UXO strike. Potential interruption to local gas supplies.	Potential significant impact to human health on-Site and off-Site. Interruption to local gas supplies.	Yes Risk Event 2
4	Construction Activities – General/Other Incident during construction e.g. structural collapse of building(s), excavation collapse, collisions from construction vehicles. Potential for significant harm to people on-site (construction workers) including potential for fatal injuries.	Potential significant impact to human health on-Site.	Yes Risk Event 3
Operational Activities (Commissioning and Commercial Operation) Credible hazard categories associated with process equipment failure, malfunction, accidental damage, vehicular impact, disturbance etc., resulting in the loss of containment of hazardous substances. The consequences depend on the type and quantity of substance released, which are considered below as fire/ explosion/toxic release/environmental harm.			

Ref.	Hazard Category	Impact/Receptor	Credible MA&D
5	Fire Significant loss of containment of ammonia, hydrogen or natural gas which immediately finds a source of ignition. Potential for harm to people. Potential for harm to the environment via release of contaminated firewater. Potential for damage to assets including buildings. Potential for domino effect, escalation to other areas on-site and off-site including nearby COMAH installations.	Potential significant impact at: Human health – on-Site & off-Site populations. Environment - Humber Estuary	Yes Risk Event 4
6	Explosion /Energy release Significant loss of containment of ammonia, hydrogen or natural gas which accumulates, and ignition is delayed, resulting in an explosion. Impact depends on release point and level of congestion within process structures on-Site. Potential for harm to people. Potential for damage to assets e.g. overhead power transmission systems, with subsequent loss of power to neighbours. Potential for domino effect, escalation to other areas on-Site and off-Site including nearby COMAH installations.	Potential significant impact at: Human health – on-Site and off-Site populations. Environment - Humber Estuary	Yes Risk Event 5
7	Toxic (Ammonia) Release Significant loss of containment of ammonia gas from onshore facilities. Consequences include potential for significant harm to people exposed to high concentrations of ammonia gas. Rainout and/or dissolution in air to form ammonium hydroxide therefore potential for harm to the environment. Emergency services may issue shelter in place orders for neighbours until incident has been resolved.	Potential significant impact at: Human health – on-Site and off-Site populations. Environment - Humber Estuary, soil and groundwater.	Yes Risk Event 6

Ref.	Hazard Category	Impact/Receptor	Credible MA&D
8	Asphyxiant (Nitrogen) Release Significant loss of containment of nitrogen gas from onshore facilities. If released into a confined area on-site where people are present, there is the potential for a release of nitrogen to result in harm via asphyxiation. If released to an open area, this gas would disperse, and concentrations would reduce to level which would not cause harm. In all scenarios, the concentration off-Site at receptors would not be sufficient to cause harm to people or the environment. Design and operational measures provide high integrity containment systems and measures for safe disposal of nitrogen, therefore not considered a credible MA&D scenario.	Potential significant impact at: Human health – on-Site.	No
9	Release of Substances into the Marine environment Scenarios include an accidental loss of containment of marine fuel oil or black grey/ballast water from marine transport. Incidents involving ammonia vessels at sea and during berthing could cause a loss of containment for example via accidental impact with other vessels or port infrastructure. A release of flammable substances could result in a fire if ignited, causing harm to people and the environment. A release of ammonia could have a significant impact on people onboard the vessel and at the port. Potential for harm to flora and fauna located at the Humber Estuary. The substances present on board vessels associated with the Project have potential for harm to the water environment if released, via an increase in Chemical and or Biological Oxygen Demand (COD/BOD) levels.	Potential significant impact at: Human health (fire which affects persons on board vessel and/or at jetty). Environment - Humber Estuary.	Yes Risk Event 7

Ref.	Hazard Category	Impact/Receptor	Credible MA&D
10	Loss of Containment of Transported Dangerous Goods (by road) Collisions/accidents involving road tankers containing hydrogen causing loss of containment, potential subsequent fire and/or explosion. Potential for significant harm to people in the vicinity of the incident who are exposed to high levels of thermal radiation and/ or explosion overpressures. Potential for damage to property located near to incident. Emergency services may close roads and potential to interrupt power and water supplies in the event of damage to infrastructure.	Potential significant impact at: Human health population (off-Site).	Yes Risk Event 8
Decommissioning Activities Credible hazard categories associated with decommissioning activities include accidental damage to existing service infrastructure such as electrical power, gas and oil pipelines.			
11	Decommissioning Activities – Dismantling Vessels and Pipework Incident occurring during decommissioning e.g. dismantling pipework and vessels using equipment which could generate a spark such as electrical grinders and saws. If systems have not been fully de-inventoried or isolated i.e. still contain flammable material there is the potential for fire and/or explosion causing harm to people on-Site. Causes include operator errors or lapses, failure in safety management systems. Failure to isolate electrical supplies prior to work on site could also result in harm to workers e.g. electrocution, arc flash injury.	Potential significant impact to human health on-Site.	Yes Risk Event 9
Disasters Credible disaster categories include intentional malicious damage to assets and infrastructure (e.g. vandalism) and potential impacts of adverse weather including future climate change effects. Consequences of such incidents generally depend on the extent of the harm caused, the proximity of people and sensitive receptors.			

Ref.	Hazard Category	Impact/Receptor	Credible MA&D
12	Malicious Damage/Conflict/Arson Various scenarios resulting in loss of containment of hazardous substances such as malicious damage to process storage tanks or pipework including Theft/malicious damage /terrorist threat - external interference - (damage to the pipelines/power supplies) Consequences are considered above - see fire/explosion/toxic release scenarios.	Potential significant impact at: Human health – on-Site and off-Site populations. Environment - Humber Estuary.	Yes (as fire/ explosion/toxic release). Considered in Risk Events 4, 5, 6
13	Domino Event Various scenarios such as fire and/or explosion at a neighbouring facility, such as the nearby oil storage terminal, high pressure gas pipeline or others which has an impact at the Project Site. This category of Risk Event also includes incidents initiated at the Project Site which could potentially escalate and have an impact at facilities within the local industrial cluster. The potential impacts to and from the Project can include loss of containment via thermal radiation related failure mechanisms or accidental impact damage from projectiles generated during an explosion.	Potential significant impact at: Human health – on-Site and off-Site populations. Environment - Humber Estuary.	Yes (as fire/ explosion/toxic release) Considered in Risk Events 4, 5, 6
14	Seismic Event/Landslide A seismic event such as an earthquake could cause structural damage to process equipment, pipework, infrastructure and buildings causing loss of containment. Consequences considered above in Risk Events 4, 5, 6.	Potential significant impact at: Human health – on-Site and off-Site populations. Environment - Humber Estuary.	No (however if one did occur could results in fire/ explosion/toxic release and the plant and equipment will be designed for the appropriate seismic zone).

Ref.	Hazard Category	Impact/Receptor	Credible MA&D
15	Storms/Flooding/Climate Change/storm surge Potential for pluvial and fluvial flooding which reaches the Project Site and overwhelms drainage systems. A major flooding event has potential to cause asset damage leading to loss of containment of dangerous substances. The consequences of such a loss of containment are considered above. Lightning strike during a storm has potential to cause ignition of highly flammable gas if this were to occur while material was being vented directly to atmosphere. This would however be a very infrequent operation.	Potential significant impact at: Human health – on-Site and off-Site populations. Environment - Humber Estuary	Yes Risk Event 10

22.6.22 The potential initiating causes and impacts from the MA&D scenarios identified in **Table 22.4** are considered in further detail within **Table 22.5**.

22.7 Mitigation Measures

22.7.1 Project objective (d) is to minimise adverse impacts on the environment and safeguard the health and safety and amenity of local residents. The mitigation measures described in this section contribute to delivering this objective.

22.7.2 The Associated Development is being developed to produce green hydrogen to replace fossil fuels and natural gas, for use in the UK's transport sector, where other sources of renewable energy cannot be used.

22.7.3 Hydrogen is highly flammable, and therefore the potential for Risk Events such as those identified in **Table 22.4** cannot be entirely eliminated. Risks must therefore be carefully controlled, and the risk reduced to ALARP via mitigation measures, as required by the COMAH Regulations (Ref 22-3). Production of hydrogen from non-hydrocarbon sources would employ ammonia, which is a commonly used industrial substance. Ammonia is a toxic material and there are associated risks with its use, however, these risks would be managed by applying safety and environmental control measures.

22.7.4 The mitigation measures associated with preventing a loss of containment for gaseous substances are substantially similar for ammonia, hydrogen and natural gas.

22.7.5 The mitigation measures associated with the identified credible MA&D scenarios for the Project are presented in **Table 22.5**. This is not intended to be an exhaustive list and presents typical measures to illustrate the controls which will be considered in further detail within the ES (including how they will be secured) and the engineering development of the Project design.

Table 22.5 Assessment of Major Accident & Disaster Risk Event Scenarios

Risk Event	Risk Event Description	Summary Description of Risk Event	Risks and Consequences before Mitigation	Mitigation Measures	Mitigated to ALARP?
1	**Contact with high voltage (HV) electricity (overhead or underground)**	Contact with overhead electrical transmission system e.g. crane impact on HV electrical cable or underground cable strike during excavation. Contact with overhead HV electricity cables can occur via accidental contact with the jib of construction cranes. Similarly, during excavation, contact of an excavator bucket with underground electrical cable.	Potential for harm to construction workers including fatal injuries. Potential interruption to local electrical power supplies.	Project notifications would be communicated to utility service providers, including National Grid and others. This service ensures up-to-date information is available on the location of above and below ground electrical cables on drawings/maps. Locations confirmed by use of specialist tools to detect underground cables and pipes. During the construction phase of the Project, activities which would be carried out in proximity to HV electrical distribution networks would be carefully controlled via risk assessments. Appropriate techniques including hand-dig would be used as required by these risk assessments. Protective measures and safety signage would be used to alert personnel to overhead and below ground electrical hazards. Only suitably qualified and experienced personnel (SQEP) would operate equipment such as cranes and excavators.	**Yes**

Risk Event	Risk Event Description	Summary Description of Risk Event	Risks and Consequences before Mitigation	Mitigation Measures	Mitigated to ALARP?
2	**Contact with underground gas main or UXO**	Potential for unexploded ordnance (UXO) on Site and gas transmission infrastructure. Impact with gas main/UXO during excavation activities causing a release of gas and fire/or explosion.	Potential for harm to construction workers including fatal injuries. Potential for harm to people off-Site via thermal radiation/explosion projectiles. Potential interruption to gas supplies used for power generation and to local industry and residents.	Measures as Risk Event 1 for underground services such as gas mains. Project would work with UK Gas Transmission services to ensure work is carried out safely where gas infrastructure has been identified as present. An UXO survey would be completed for the Site and any remedial activities safety complete prior to construction commencing.	**Yes**
3	**Construction incident – structural collapse, collision**	Incident such as structural collapse of building(s) and/ or process structures caused by inadequate design, accidental impact from vehicle, malicious interference etc. Excavation collapse caused by inadequate supports. Collisions with vehicles, such as	Potential for significant harm to construction workers including fatal injuries.	The engineering design of the Project, in particular, civil and structural engineering would be carried out in accordance with all applicable legislative requirements and industry standards. Groundworks to ensure site stability would be carried out as part of the Project development. Equipment and vehicles used during construction would be carefully selected and appropriate temporary construction access installed. Security controls would be in place throughout construction including guards	**Yes**

Risk Event	Risk Event Description	Summary Description of Risk Event	Risks and Consequences before Mitigation	Mitigation Measures	Mitigated to ALARP?
		overturning or when reversing.		and CCTV to prevent unauthorized access to Site.	
4	**Fire**	Significant loss of containment of ammonia, hydrogen or natural gas caused by accidental damage or failure of containment systems. Fire could also be initiated via malicious damage/conflict/arson. Potential for fire at a neighbouring major hazard installation to escalate to site via domino effect. Also, potential for fire at Project Site to have an impact on neighbouring sites. Storm events such as flooding could initiate a loss of containment via damage to assets. Lightning strike could ignite flammable gas/vapour released	Potential for significant harm to people on-Site, including fatal injuries and harm to people off-Site via thermal radiation. Potential for domino effect, escalation to other areas on-Site and off-Site including COMAH installations. Escalation of the fire to other installations at the Port of Immingham could initiate emergency plans at those sites causing a significant disruption to critical facilities, along with potential harm to persons on those sites and damage to their assets. Potential for direct harm to the environment from thermal radiation such	Measures included in design to reduce the potential for a loss of containment include the following: - Engineering design of the facility by experienced, qualified personnel. - The specification, construction and installation of equipment and pipework to industry codes and standards. - Plant design and plant layout to keep hazardous substances as far as is practical from off site receptors - Engineering design risk assessments and Quantified Risk Assessment (QRA) carried out to demonstrate ALARP as required by the COMAH Regulations (Ref 22-3). - DOMINO discussions with neighbouring COMAH facilities - Use of fully welded connections rather than flanged connections for gaseous systems. Flange guards are to be fitted as necessary where welding is not practical.	**Yes**

Risk Event	Risk Event Description	Summary Description of Risk Event	Risks and Consequences before Mitigation	Mitigation Measures	Mitigated to ALARP?
		from vent stack or relief valve. Gas which immediately finds a source of ignition will result in flash or jet fire depending on pressure.	as impact on flora and fauna near to Site. Also, harm to the environment via release of contaminated firewater to environmental receptors including the Humber Estuary. Emergency services are likely to advise local residents to close doors and windows and remain indoors for the duration of the event.	- The Pressure Systems Safety Regulations 2000 (PSSR) (Ref 22-17) apply to equipment and pipework at the Site. Compliance with PSSR requires detailed scheduled inspection and testing to prevent a loss of containment. - Certification of equipment by notified bodies prior to use which demonstrate “fit for purpose” equipment. - Control systems to be installed to continuously monitor process parameters including pressure and temperature. - Safety instrumented systems would be designed, operated and maintained in accordance with guidance documents BS 61508/11 (Ref 22-11, 22-12) which is recognised as providing best practice. - Fire and gas detection and alarm systems would be in operation. - Passive and active fire suppression systems would be employed subject to risk assessments.	

Risk Event	Risk Event Description	Summary Description of Risk Event	Risks and Consequences before Mitigation	Mitigation Measures	Mitigated to ALARP?
				- A flare system would be used for safe disposal of flammable gas in the event of a process upset. - All process areas of Site would be subject to hazardous area classification, to determine where mechanical and electrical equipment is to be certified in accordance with the A Appareils destinés à être utilisés en ATmosphères EXplosives (ATEX) Directive (Ref 22-18), to reduce the risk of an active source of ignition. This would be carried out as part of the programme of compliance with the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) (Ref 22-9) at the Project. DSEAR implements both EU ATEX directives, the 'equipment directive' (Ref 22-18) and the 'workplace directive' (Ref 22-19) into UK Legislation. Currently, no changes are planned to these Regulations as a result of the UK leaving the EU. - Anhydrous ammonia would be stored and handled as a liquid in a cold/refrigerated condition. This is inherently safer than storing, handling, and transporting as a compressed gas	

Risk Event	Risk Event Description	Summary Description of Risk Event	Risks and Consequences before Mitigation	Mitigation Measures	Mitigated to ALARP?
				at ambient temperature and high pressure. The management and operational controls to reduce the potential for a loss of containment include the following: - Operation and management of the facility by experienced, qualified personnel. - Security systems to be deployed including cyber security - - Operability risk assessments carried out during design phase. - A Safety Management System (SMS) would be developed and in place prior to operation, incorporating Management of Change (MoC) procedures. - Planned preventative maintenance systems to prevent equipment defects and failures. - Inspection regimes to detect corrosion and other defects. - Emergency planning and response procedures including regular live tests. - A risk assessment in accordance with DSEAR (Ref 22-08) would be	

Risk Event	Risk Event Description	Summary Description of Risk Event	Risks and Consequences before Mitigation	Mitigation Measures	Mitigated to ALARP?
				produced prior to operation including Hazardous Area Drawings. These drawing define areas where electrical and mechanical equipment is to be appropriately certified in accordance with the ATEX Directives (Ref 22-18, 22-19).	
5	**Explosion/Energy release**	Significant loss of containment of ammonia, hydrogen or natural gas caused by accidental damage or failure of containment systems. Explosion could also be initiated via malicious damage/conflict/arson. Potential for incident at a neighbouring major hazard installation to escalate to Site via domino effect and vice versa. If released gas accumulates and ignition is delayed, an explosion could occur.	Potential for significant harm to people on-Site, including fatal injuries and harm to people off-Site via explosion overpressure. Potential for damage off-Site such as broken glass, impact from projectiles. Potential for damage to critical assets e.g. overhead power transmission systems. Potential for domino effect, escalation to other areas on-Site and off-Site including COMAH installations.	The design and operating mitigation measures are the same as those defined for Risk Event 4, which is a major fire. Principally, these measures involve preventing a loss of containment by applying industry standards and best practice to the engineering design of the facilities which would be subject to rigorous safety assessments. These measures are a fundamental requirement for legislative compliance, without which the facility would not be permitted to operate.	**Yes**

Risk Event	Risk Event Description	Summary Description of Risk Event	Risks and Consequences before Mitigation	Mitigation Measures	Mitigated to ALARP?
		Degree of impact depends on release point and level of congestion within process structures on-Site.			
6	**Release of toxic gas**	Significant loss of containment of ammonia gas from onshore facilities caused by accidental damage, failure of containment systems or malicious damage. Potential for incident at a neighbouring major hazard installation to escalate to and from site via domino effect. Material could be released as gas or rainout and/or dissolution in air to form ammonium hydroxide.	Potential for significant harm to people on-Site, including fatal injuries and harm to people off-Site via contact with ammonia. Emergency services are likely to advise local residents to close doors and windows and remain indoors for the duration of the event. Significant interruption to operations at Immingham Port and other key locations. Potential for harm to the environment if material released to Humber Estuary.	The principal design and operating mitigation measures are be as those defined for Risk Event 4. In addition to these measures, a specific toxic gas detection system would be installed, with a corresponding emergency alarm and procedures. This would allow an early intervention by operators in the event of an accidental loss of containment of ammonia.	**Yes**

Risk Event	Risk Event Description	Summary Description of Risk Event	Risks and Consequences before Mitigation	Mitigation Measures	Mitigated to ALARP?
7	**Release to marine environment**	Scenarios involving a direct release of harmful material to the Humber Estuary include: An accidental release of marine fuel oil or black/grey/ballast water from marine transport. Accidental damage to ammonia vessels such as during berthing causing loss of containment.	Potential for significant harm to persons on board vessels, at jetties or other locations close to vessels. A release of flammable substances such as fuel oil leading to potential for fire if ignited, resulting in harm to people and the environment. If not ignited, material could form a plume on water restricting oxygen supplies to the marine environment. All substances listed have potential for harm to the water environment if material(s) released, via increase in Chemical and or Biological Oxygen Demand (COD/BOD) levels.	Measures included in design to reduce the potential for a loss of containment to the marine environment include the following: - The fuel systems onboard ships would be designed to the appropriate maritime engineering standards. These would include the technical integrity of the fuel storage systems, leakage detection and spill containment. - Fuel leaks would be readily detected by devices such as flow and pressure indicators and isolated (using isolation valves etc.) to minimise the loss of material to secondary containment. - Onshore facilities at the port are to be used for the treatment and disposal of ballast/grey/black water. This material would not be discharged to the Humber Estuary. - The design and operation of the VLGC would incorporate safety features, primarily the robust design of the ship and cargo tanks, which typically incorporate a double-hull construction. - Lloyds Register publish a list of standards to be adopted for the ammonia transport ships, contained in	**Yes**

Risk Event	Risk Event Description	Summary Description of Risk Event	Risks and Consequences before Mitigation	Mitigation Measures	Mitigated to ALARP?
				'The Rules and Regulations for the Construction and Classification of Ships for the Carriage of Liquefied Gases in Bulk', published July 2022 (Ref 22-20). - Control systems including Emergency Shutdown (ESD) systems, would be designed, and installed according to engineering design standards, such as those published by International Electrotechnical Commission (IEC). These systems minimise the potential for human error and mitigate the consequences, should an error be made, by a fast, safe shutdown of the transfer systems. - In the event of a fire onboard vessels or at the jetty, a safe haven would be constructed to allow people in the area to reach a place of safety. This is typically onshore at the base of the jetty. The management and operational controls to reduce the potential for a loss of containment include the following: - An oil spillage plan would be produced prior to operation as required by the International Convention for the Prevention of Pollution from Ships	

Risk Event	Risk Event Description	Summary Description of Risk Event	Risks and Consequences before Mitigation	Mitigation Measures	Mitigated to ALARP?
				(MARPOL) Annex 1, Regulations for the Prevention of Pollution by Oil, Regulation 26 (Ref 22-21) The MARPOL convention is enacted in the UK via The Merchant Shipping (Prevention of Oil Pollution) Regulations 2019 (Ref 22-22). - A Navigation Risk Assessment (NRA) to be developed in consultation with stakeholders including the Port operator. Prior to operation, an ERA would be produced for the Project which will use best practice such as the CDOIF methodology described in **Table 22.2**. This assessment would determine the sufficiency of protection measures in the event of a scenario such as a release to the marine environment and conclude if risks are within the tolerable category.	
8	**Release during road transport off-site**	Collisions/accidents involving road tankers containing hydrogen causing loss of containment, leading to fire and/or explosion.	Potential for significant harm to persons within and near to vehicle including potential fatalities. Significant interruption to road traffic, requiring	The design, construction, operation, maintenance and repair of road vehicles for the transport of hydrogen would be in accordance with The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (Ref 22-23).and ADR.	**Yes**

Risk Event	Risk Event Description	Summary Description of Risk Event	Risks and Consequences before Mitigation	Mitigation Measures	Mitigated to ALARP?
			intervention by emergency services.	Vehicles containing hydrogen would be driven by specialist drivers only. Training and management of these drivers would be in accordance with this legislation and supported by advice from a dangerous goods safety advisor.	
9	**Decommissioning Activities – Dismantling Vessels and Pipework**	An incident occurring during decommissioning such as dismantling pipework where vessels have not been fully de-inventoried or isolated (still contain flammable material). Potential for fire and/or explosion. Failure to isolate services such as electrical cabling during these activities could also result in harm to human health, such as electrocution.	Potential for significant harm to persons on-Site carrying out activities, including potentially fatal injuries. Due to quantities involved which would be less than normal operation, no impact would be expected off-Site.	At the end of the operational life of the Project, there are a number of factors which must be considered to safely carry out the decontamination, decommissioning and disposal of process equipment and pipework which has contained the dangerous substances. These include ensuring systems are 'gas-free' via the removal of the inventory, venting systems to atmosphere and ensuring they are sufficiently clean so no remaining gas can be detected. Comprehensive plans for decommissioning safety and environmental management would be developed prior to work commencing, to risk assess tasks and produce method statements for the work. This would be required as part of the COMAH Safety Report. All decommissioning work to be controlled via permit to work systems.	**Yes**

Risk Event	Risk Event Description	Summary Description of Risk Event	Risks and Consequences before Mitigation	Mitigation Measures	Mitigated to ALARP?
				Isolation procedures such as 'Lock-out/Tag-Out' are standard industrial practice for the isolation of electrical systems on process and manufacturing sites.	
10	**Storms / Flooding / Climate Change**	Potential for pluvial and fluvial flooding to cause asset damage leading to loss of containment of substances, consequences considered above within Risk Events 4, 5 and 6. Lightning strike during storm has potential to cause ignition of highly flammable gas. Potential for the frequency and severity of consequences of storm events could increase as a result of climate change.	Potential for significant harm to persons on Site in the event of a loss of containment via fire/ explosion/toxic release. Potential for harm to people off-Site in the event of a major release. Potential harm to the environment e.g. via release of contaminated flood water.	Flood risk assessments will be carried out to inform the addition of flood protection measures, if required. Climate change resilience is a consideration under the COMAH Regulations (Ref 22-3) e.g. flooding as a consequence of climate change is considered as an initiating event for a major accident hazard. Design and construction of drainage systems in accordance with civil engineering codes and standards to withstand storm events. Engineering design of jetty and other systems to allow for potential increase in tidal range and potential climate change impacts.	**Yes**

22.8 Preliminary Assessment of Residual Effects

Construction

22.8.1 The potential risk events during Project construction activities have been identified and assessed in **Tables 22.4** and **22.5**. Where risks cannot be eliminated, they would be reduced to ALARP and the residual risks associated with construction hazards managed via the controls listed in **Table 22.5**. The controls and mitigation measures are primarily compliance with the CDM Regulations (Ref 22-8) and the development and use of a comprehensive CEMP.

22.8.2 A COMAH Pre-Construction Safety Report would be submitted for review by the competent authority prior to Project construction. The purpose of this report is to demonstrate to the competent authority that all measures necessary to reduce risk have been taken.

Operation

22.8.3 The presence of toxic and flammable gases during Project operation means that their associated hazards cannot be entirely eliminated, but must be managed to reduce risks to ALARP, in accordance with the HSE's requirements under the COMAH Regulations (Ref 22-3). Risk reduction and mitigation would be via compliance with all applicable UK legislation and the adoption of UK and worldwide industry standards and best practice used for the design of process equipment.

22.8.4 Continuous monitoring would observe operational conditions such as temperature and pressure, with routine inspection and planned preventive maintenance carried out on all assets to ensure the plant operates safely and efficiently.

22.8.5 All personnel associated with the operation of the Project facilities would be subject to the highest standards of training and competency assurance, including process operators, vessel and jetty personnel and road tanker drivers.

22.8.6 The proposed operation of the Site and the on and off site emergency plans would be subject to rigorous appraisal by the COMAH competent authority and other stakeholders. The operator of the facility would be required to notify the competent authority prior to operation and submit the Safety Report for review. The competent authority would authorise Site operations through review/assessment of the COMAH Safety Report.

22.8.7 When operational, the Site would form part of a COMAH cluster. The purpose of these groups is to share information and provide a cooperative, collaborative forum for operators of COMAH sites. The information shared includes the hazards which are present on each site and emergency response plans. Humberside is one of the main clusters in the UK, with sites working together to share information with local residents and people working near the sites as well as with the competent authority and local authorities.

Decommissioning of the hydrogen production facility

22.8.8 Process substances present at the facility are primarily flammable gases, therefore risks would be reduced to ALARP during decommissioning via controls such as the use of equipment including electrical tools. Prior to dismantling equipment and pipework, the contents would be safely vented to ensure no flammable or toxic materials remain and portable gas detectors would be used to confirm a 'gas-free' status prior to commencement of work.

22.9 Summary of Preliminary Assessment

22.9.1 The purpose of this PEI Report chapter is to present a high level assessment to identify and describe the potential, credible MA&D scenarios which could be pertinent to the Project, which is defined within **Chapter 2: The Project** and comprises a jetty in the Humber Estuary to import and export liquid bulk products and a landside facility to convert ammonia to hydrogen which will be liquified and transported off site for use.

22.9.2 A total of 15 potential hazardous scenarios were initially identified, of which ten (10) were considered credible and therefore termed Risk Events, requiring further assessment. These Risk Events include incidents such as fire and/or explosion caused by a major loss of containment of flammable and toxic gases.

22.9.3 Potential Risk Events have been identified during construction, operation and decommissioning phases of the Project.

22.9.4 The consequences of Risk Events identified are primarily harm caused to people present on-Site. This is as a result of any exposure to thermal radiation generated by fire, exposure to explosion overpressure, impact with missiles such as glass fragments and exposure to toxic ammonia gas. The harm caused by these events can include the potential for fatal injuries, corresponding to the criteria for a MA&D established in **Paragraph 22.2.7**.

22.9.5 There are potentially harmful consequences to the environment as a result of the identified Risk Events. These include direct harm from thermal radiation to flora and fauna in and around the Humber Estuary caused by a major fire. A release of harmful substances such as MFO from vessels transporting ammonia to Site could also cause harm which could potentially correspond to the criteria established in **Paragraph 22.2.7**, which is long term damage to 0.5 ha of the river.

22.9.6 The Project would produce a flammable gas from a toxic gas transported by sea and so it is not possible to eliminate risks entirely. Risk must therefore be reduced by a comprehensive safety and environmental protection programme implemented via engineering design, operational measures and management to achieve a level ALARP, as required by the COMAH Regulations (Ref 22-3).

22.9.7 The Project would comply with all relevant safety and environmental legislation for the management of risks on industrial facilities, from the design and construction phase, through operation and eventual decommissioning.

22.9.8 Further analysis of the level of potential harm to people and the environment, and more detailed information on the mitigation and control measures associated with

the Project will be available as the design progresses and will be included within the ES.

22.10 References

Ref 22-1 HMSO (1974). Health and Safety at Work etc. Act 1974.

Ref 22-2 IEMA (2020). Major Accidents and Disasters in EIA: A Primer.

Ref 22-3 HMSO (2015). The Control of Major Accident Hazard (COMAH) Regulations 2015.

Ref 22-4 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 SI 572.

Ref 22-5 HMSO (2012). Directive of the European Parliament and Council, 4th July 2012 on the control of major accident hazards involving dangerous substances (2012/18/EU) (the 'Seveso III' Directive).

Ref 22-6 HMSO (2000). The Pipelines Safety Regulations 2000.

Ref 22-7 HMSO (2015). The Planning (Hazardous Substances) Regulations 2015.

Ref 22-8 HMSO (2015). The Construction (Design and Management) Regulations 2015.

Ref 22-9 HMSO (2002). The Dangerous Substances and Explosive Atmospheres Regulations (DSEAR).

Ref 22-10 CDOIF (2016). Chemical and Downstream Oil Industries Forum Guideline V2.0.

Ref 22-11 British Standards (2010). BS EN 61508-1 Functional safety of electrical/electronic/ programmable electronic safety-related systems. General requirements.

Ref 22-12 British Standards (2017). BS EN 61511 - Functional safety. Safety instrumented systems for the process industry sector (multi-part document).

Ref 22-13 HMSO (2015). The Classification, Labelling and Packaging of Chemicals (Amendments to Secondary Legislation) Regulations 2015.

Ref 22-14 Reuters (2016). Malaysia's Petronas Chemicals says 2 killed from ammonia leak at plant.

Ref 22-15 CBC (2015). Ammonia leak at Medicine Hat nitrogen plant kills worker.

Ref 22-16 Chemical and Engineering News (2019). Hydrogen blast led to deaths at US silicones plant.

Ref 22-17 HMSO (2000). The Pressure Systems Safety Regulations 2000.

Ref 22-18 Official Journal of the European Union (2014). Directive 2014/34/EU - Equipment and protective systems intended for use in potentially explosive atmospheres (ATEX 114 "equipment" Directive).

Ref 22-19 Official Journal of the European Union (1999). Directive 1999/92/EC - Minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres (ATEX 153 "workplace" directive).

Ref 22-20 Lloyds Register (2022). The Rules and Regulations for the Construction and Classification of Ships for the Carriage of Liquefied Gases in Bulk.

Ref 22-21 International Maritime Organisation (1973). International Convention for the Prevention of Pollution from Ships (MARPOL) Adoption: 1973 (Convention), 1978 (1978 Protocol), 1997 (Protocol - Annex VI); Entry into force: 2 October 1983 (Annexes I and II).

Ref 22-22 HMSO (2019). The Merchant Shipping (Prevention of Oil Pollution) Regulations.

Ref 22-23 HMSO (2009). The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009.

Ref 22-24 HMSO (2016). The Environmental Permitting Regulations (2016).

Ref 22-25 Health and Safety Executive (HSE). HSE’s Land Use Planning Methodology (https://www.hse.gov.uk/landuseplanning/methodology.htm).

22.11 Abbreviations and Glossary of Terms

Table 22.5 Glossary and Abbreviations

Term	Acronym	Meaning
As Low as Reasonably Practicable	ALARP	Term used by UK Regulatory Authorities and throughout industry to denote that risk is reduced to a level which is a low as practically achievable with existing technology.
Atmosphere Explosive	ATEX	EU Directive on the protection of people from explosive / flammable atmospheres and the selection of equipment to be used in such areas.
Best Available Technology	BAT	BAT assessments are used to establish evidence-based means to prevent pollution and achieve environmental permit conditions for industrial installations.
Biochemical Oxygen Demand	BOD	A parameter for determining the degree of contamination of water related to the amount of oxygen used by microorganisms to breakdown organic substances.
British Geological Survey	BGS	Industry organisation publishing geological information including groundwater designations.
Chemical and Downstream Oil Industries Forum	CDOIF	Industry organisation publishing guidance on best practice for the chemical and downstream oil industries aimed at delivering health, safety and environmental improvements.
Chemical Oxygen Demand	COD	A parameter for determining the degree of contamination of water related to the amount of oxygen required to breakdown organic substances chemically.
Construction, Design and Management Regulations	CDM	UK Regulations for control of construction activities.
Classification, Labelling and Packaging Regulations	CLP	UK Regulations for control of substances which implement harmonized means of classification into hazards, and the appropriate labelling and packaging corresponding to these hazards.
Control of Substances Hazardous to Health Regulations	COMAH	UK Regulations for managing risk from major accident hazard installations.

Term	Acronym	Meaning
Dangerous Substances and Explosive Atmospheres Regulations	DSEAR	UK Regulations for control of dangerous and flammable substances which implements the EU ATEX Directive
Environmental Risk Assessment	ERA	A structured assessment to determine the risk to environmental receptors following a release of harmful substances.
Front End Engineering Design	FEED	An early stage in the engineering design process for projects, following proof of concept but prior to detailed engineering commencing.
Hazards of Construction Hazards of Demolition Hazard Identification Hazard and Operability	HAZCON HAZDEM HAZID HAZOP	Formal process safety assessments used to identify and assess potential hazards at defined stages in engineering design and operation of a facility.
Health and Safety Executive	HSE	UK Health and Safety Regulator and statutory consultee
Hazardous Substances Consent	HSC	UK Regulations for installations storing and/or using dangerous substances which is regulated by Local Authorities for planning purposes.
High Voltage	HV	High voltage electricity is typically categorised as above 1 kV, a level which would be harmful and potentially fatal to people.
Immingham, Eastern Roll-on, Roll-off Terminal	IERRT	A proposed development currently going through the planning stages near to the Project Site.
International Electrotechnical Commission	IEC	Organization which publishes international standards for all electrical, electronic and related technologies.
Institute of Environmental Management and Administration	IEMA	Industry organisation publishing environmental guidance including EIA.
Major Accident to the Environment	MATTE	A term used within the COMAH Regulations to define incidents to the environment which are assessed to have a specific level of harm and frequency of occurrence.
Major Accident Prevention Document	MAPD	A ‘Safety Case’ prepared by operators of major hazard pipelines to demonstrate that the risk is being appropriately managed.

Term	Acronym	Meaning
Marine Fuel Oil	MFO	Specific grade of hydrocarbon fuel used on ships / vessels.
Management of Change	MOC	A system of procedures for controlling changes made to industrial facilities, to ensure there are no adverse safety or environmental implications of the change.
Pipelines Safety Regulations	PSR	UK Regulations for major accident hazard pipelines such as those containing hydrogen which are not fully contained within a facility.
Quantitative Risk Assessment	QRA	A detailed study of risk, applying values of frequency and severity to a hazard to obtain a value of risk level.
So Far as Is Reasonably Practicable	SFAIRP	Risk is reduced to a level which is as low as can be practically achieved with existing technology but is balanced with economic availability.
Safety Instrumented System	SIS	Instrumented control functions for process operations such as automatic trips.
Safety Management System	SMS	A series of policies and procedures developed and implemented by Operators of major accident hazard pipelines and COMAH Installations to deliver an appropriate standard of safety.
Suitably Qualified and Experienced Personnel	SQEP	A term used within UK industries to ensure only appropriately competent personnel are allowed to work where safety is very important, such as drivers of vehicles transporting hydrogen.
Unexploded Ordnance	UXO	Bombs which have been dropped or discarded during military activities which may explode if disturbed. Surveys are used to detect these prior to construction and safely dispose of material which is found.
Very Large Gas Carriers	VLGC	Large ships/vessels used to transport liquefied gases.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 23: Socio-economics

Associated British Ports

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Table of contents

Tables

23 Socio-economics

23.1 Introduction

23.1.1 This chapter presents the preliminary findings of the assessment of the likely effects of the Project on socio-economics. This includes considering potential impacts on the following:

a. Employment (including training and apprenticeship opportunities) and effects on local community;

b. Users of recreational routes and Public Rights of Way (PRoW); and

c. Private assets (including residential properties, development land, local businesses, community facilities, open space and visitor attractions relevant for tourism).

23.1.2 This chapter interacts with the following chapters (PEI Report Volume II), in respect of employment generation:

a. **Chapter 6: Air Quality;**

b. **Chapter 7: Noise and Vibration;**

c. **Chapter 11: Traffic and Transport;**

d. **Chapter 12: Marine Transport and Navigation;**

e. **Chapter 13: Landscape and Visual;** and

f. **Chapter 24: Human Health and Wellbeing**

23.2 Approach to Assessment

Scope and Methods

23.2.1 A scoping exercise was undertaken in August 2022 to establish the form and nature of the socio-economics assessment, and the approach and methods to be followed.

23.2.2 The Scoping Report (**Appendix 1.A** of PEI Report, Volume IV) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on socio-economics.

23.2.3 The Scoping Opinion (**Appendix 1.B** of PEI Report, Volume IV) provided by the Planning Inspectorate provides comments on the information that is to be provided in the Environmental Statement (ES). **Table 23.1** sets out the comments which are relevant to the socio-economics assessment and how the comments are addressed in this Preliminary Environmental Information (PEI) Report Chapter.

Table 23.1 Scoping Opinion comments for socio-economics

Consultee	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	The Scoping Report seeks to scope out this matter as there are no tourism receptors in proximity to the Project, therefore it is unlikely there would be any impact experienced by tourists. Given the location of the development the absence of sensitive tourism receptors (other than the England Coast Path which is being assessed separately) the Inspectorate agrees that it is unlikely that significant effects on tourism would arise and this matter can be scoped out of the assessment on this basis.	Noted.
Planning Inspectorate	Two PRoWs are in proximity to the Project and it is proposed to scope this out of the assessment as user experience during operation would be as it is currently. The Inspectorate agrees that this matter can be scoped out on this basis.	The impact on PRoW/bridleway during the construction and decommissioning phases have been assessed. Impact during the operational phase has been scoped out as it is assumed that the PRoW/Bridleway would re-open.
Planning Inspectorate	The Scoping Report states that the ES would include a figure to denote the relevant study areas. This should include the relevant Lower Layer Super Output Areas (LSOAs) and the Grimsby travel to work area (TTWA) in relation to the Project. Residential and business properties on Queens Road within the Project order limits should be clearly identified in any figures to help residents and businesses to identify likely impacts.	A figure to show socio-economic receptors is included as part of the baseline analysis for socio-economics within the PEI Report (**Section 23.3**).

Consultee	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	The Applicant refers to 2011 Census data and the Inspectorate notes that the 2021 Census data is now made available through the Office for National Statistics. As the DCO application will be submitted after the release of the 2021 Census data, this data should be used to inform the Socio-economic assessment.	2021 Census data has been provided within the baseline data of the PEI Report, where available (**Section 23.3**).
Planning Inspectorate	The Scoping Report proposes to assess the impact of a changing influx of workers, however it does not explicitly refer to effects on housing availability and effects on social cohesion in this chapter. The Inspectorate notes these matters are referenced under the chapter on health and well-being (para 23.4.3 of the Scoping Report). The assessment in the ES should consider if any likely significant effects would arise from the influx of construction workers on the local housing and rental market. This should cross-refer to the other relevant sections of the ES such as the assessment of health and well-being.	The baseline analysis and construction section has considered whether the local private rented sector can accommodate the influx of construction workers within the local area (**Sections 23.3** and **23.5**). The impact on primary healthcare has also been considered. Impacts upon Social Cohesion in respect of perception of risk and community severance have been assessed within **Chapter 24: Human Health and Wellbeing**.
Immingham Town Council	Residents and businesses are rightly concerned about the potential Compulsory Purchase of their properties and land. Resulting in loss of jobs and homes. If they are not included, as some maps indicate they need to be informed to ease their minds. If they are included it seems unnecessary as there is so much other land on the development that consideration should be given to leaving them alone.	An analysis of the impact on Private Assets (including residential properties, business premises, community facilities and development land) has been undertaken as part of the Socio-economic assessment for the construction, operational and decommissioning phase (**Section 23.5**).
UK Health Security Agency / Office for Health Improvement and Disparities	The scoping report does not identify the projected numbers of construction workers required for the scheme but does scope in potential social impacts from their presence. The presence of significant numbers of workers	The baseline analysis and construction section has considered whether the local private rented sector can

Consultee	Summary of Response	How comments have been addressed in this chapter
	could foreseeably have an impact on the local availability of affordable housing, particularly that of short-term tenancies and affordable homes for certain communities. The cumulative impact assessment will need to consider this across the wider study area given the existing plans for Immingham and the number of other large schemes proposed within the region. Access to accommodation for residents with the least capacity to respond to change, for example, where there may be an overlap between construction workers seeking accommodation in the private rented sector, and people in receipt of housing benefit / low paid employment seeking the same lower-cost accommodation, should be considered. It should be noted the Housing Needs Assessment for North-East Lincolnshire Council (2019) identifies the private rented sector makes a significant contribution to meeting affordable housing needs. There are a number of infrastructure schemes proposed for the wider region, increasing the potential for non-home-based construction workers to be seeking accommodation.	accommodate the influx of construction workers within the local area (**Sections 23.3** and **23.5**).
UK Health Security Agency / Office for Health Improvement and Disparities	The peak numbers of construction workers and non-home-based workers should be established and a proportionate assessment undertaken on the impacts for housing availability and affordability and impacts on any local services. Any cumulative impact assessment should consider the impact on demand for housing by construction workers and the likely numbers of non-home-based workers required across all schemes.	The construction, operational and decommissioning analysis section of the PEI Report has considered the impact placed upon primary healthcare facilities within the local area. The construction assessment has also considered the impact upon the local rented housing sector, as a result of the influx of construction/ operational/ decommissioning workers (**Section 23.5**).

23.2.4 Having regard to the information presented within the Scoping Report (**Appendix 1.A** of PEI Report, Volume IV), the Planning Inspectorate's Scoping Opinion (**Appendix 1.B** of PEI Report, Volume IV) has also confirmed the Applicant's view that significant effects on Tourism and PRoW links (during the operational phase) are unlikely. Accordingly, these matters will remain scoped out of consideration in the ES.

Legislation, Policy and Guidance

23.2.5 **Table 23.2** presents the legislation, policy and guidance relevant to the socio-economic assessment and details how their requirements will be met.

Table 23.2 Relevant legislation, policy and guidance regarding socio-economics

Legislation / Policy / Guidance	Consideration within the PEI Report
National Policy Statement for Ports (NPSfP) (Ref. 23-3)	
This NPS provides the framework for decisions on proposals for new port development and recognises that ports have a vital role in the import and export of energy supplies. The NPS states that ensuring security of energy supplies through our ports will be an important consideration and that ports need to be responsive both to changes in the types of energy supplies needed and changes in the geographical pattern of demand for fuel. Within the document, it recognises that ports continue to play an important role in local, regional and national economies. In relation to socio-economics (section 5.14), it is stated that assessments should consider all relevant impacts including: • the creation of jobs and training opportunities; • the provision of additional local services and improvements to local infrastructure; • effects on tourism; and • the impact of a changing influx of workers during the different construction phases, which could change the local population dynamics and alter demand for services and facilities (including community facilities and physical infrastructure such as energy, water, transport and waste). There could also be effects on social cohesion, depending on how populations and service provision change as a result of the development; and • cumulative effects arising from granted development consent from projects in the same region and built over a similar timeframe.	Provides guidance on the relevant impacts to consider as part of the assessment, which have been taken into consideration in the assessment of effects (**Section 23.5**)

Legislation / Policy / Guidance	Consideration within the PEI Report
The National Planning Policy Framework (NPPF) (Ref. 23-4)	
Paragraph 8 of the NPPF maintains the presumption in favour of sustainable development, which should be delivered in accordance with three main policy objective areas: economic, social and environmental. Paragraph 152 and 158 state that local planning authorities are encouraged to support the delivery of low carbon energy and associated infrastructure to increase the use of renewable and low carbon energy and help to move towards a low carbon economy.	Encouraging sustainable development has been considered throughout the Socio-economic assessment in **Section 23.5**.
The National Planning Practice Guidance (Ref. 23-5)	
This accompanies the revised NPPF and provides guidance on planning and the economy (including economic development, jobs and employment opportunities).	Economic development, jobs and employment opportunities have been assessed in **Section 23.5**.
North East Lincolnshire Local Plan (Ref. 23-6)	
The North East Lincolnshire Local Plan was adopted in 2018 and provides a planning framework to meet local development needs for the period 2013-2035, with a focus on '*creating opportunities for people'*. It states that the intention is to create 8,800 new jobs between 2013-2032, focused around five key economic sectors, two of which are: ports and logistics, and, renewable energy. The Project falls within two site allocations as part of the local plan: ELR001, a strategic proposed employment allocation site on Kings Road, which is 21.6ha in size and ELR025a, a site reserved for long term business expansion.	The Project will provide a number of construction/operational/decommissioning jobs within these relevant sectors, which has been assessed as well as the impact upon Development Land in **Section 23.5**.
North East Lincolnshire Economic Strategy (Ref. 23-7)	
Produced in 2021, this document recognises that ports and logistics as well as renewable energy are two key economic sectors in North East Lincolnshire. It recognises that the ports and logistics sector continue to be one of North East Lincolnshire's largest employers and the development of the ports has helped to underpin the growth of the local economy. The ports of Immingham and Grimsby are stated to be a critical part of the supply chain for sustainable energy generation and other energy production. As well as this, renewable energy is another key economic sector in the region. It states that North East Lincolnshire forms part of the 'Energy Estuary' and investment in the renewables sector has attracted a range of inward investors and significant	The Project will create a number of employment opportunities within these key economic sectors, which is assessed in **Section 23.5**.

Legislation / Policy / Guidance	Consideration within the PEI Report
future development is planned. It also states that in 2020, the Humber submitted a joint bid for Freeport status, covering a 45km area, including Grimsby and Immingham. The key objectives of a Freeport are to attract investment, create high value jobs, promote research and development, innovation and clean technology and practices, which is key for the future of the local economy.	
North East Lincolnshire Economic Recovery Plan (Ref. 23-8)	
The Economic Recovery Plan outlines the short and long term plan to support local businesses, create employment opportunities and reshape our future economy, especially since the COVID-19 pandemic and the changes brought about by Brexit. Three roadmaps have been developed (Restore, Reshape and Replenish). One of the key aims of the strategy is to *'ensure low carbon and green energy is our focus, grasping the opportunity to be nationally recognised as the place for leading edge of Offshore Wind Operations and Maintenance, Renewable Power Generation, Carbon Capture, Hydrogen and Biofuel production'.*	The Project will provide new port infrastructure which will foster the local authority's aspiration to develop its energy sector locally. As part of this, the Project will facilitate growth of the local energy sector by creating a number of local employment opportunities and contributing gross value added (GVA), which is assessed in **Section 23.5**.
Greater Lincolnshire Local Enterprise Partnership (LEP) Strategic Economic Plan (Ref. 23-9)	
The Strategic Economic Plan was produced in 2016 by Greater Lincolnshire (LEP), consisting of the Unitary Authorities of North and North East Lincolnshire, the County of Lincolnshire and seven districts. One of the key priorities is listed as seeking to drive growth of the area's defining and strongest sectors, one of which is the low carbon economy, with a particular focus on renewable energy, and, to grow specific opportunities identified as future defining features of the area, one of which is ports and logistics.	The Project will seek to develop the local energy sector, which is assessed in **Section 23.5**.

Scope of the Assessment

Methodology

23.2.6 There is currently no industry-recognised guidance on methodology for undertaking assessments of socio-economic effects. The assessment follows best practice methodology from other assessments undertaken on comparable port infrastructure schemes.

23.2.7 The Project has the potential to result in a wide range of socio-economic effects from the construction stage, through operation and decommissioning, which differ in permanence. For the purposes of this chapter, due consideration is given to the Project in terms of effects on or arising from the following:

a. Socio-economics (employment and Gross Value Added);

b. Recreational routes and PRoW (for construction and decommissioning only);

c. Private assets (including residential properties, business premises and community facilities);

d. Development land; and

e. Influx of workers.

23.2.8 In the assessment of development land, planning applications are included if: they are within the development land study area (500m as described in **Table 23.11**); are either consented or pending approval; are of relevance to the receptors in this socio-economic assessment.

23.2.9 Further details on the methodology for the socio-economics assessment of the Project are detailed below:

a. An assessment of the likely scale, permanence and significance of effects associated with socio-economics, recreation, and private assets receptors; and

b. An assessment of the potential cumulative impacts with other schemes within the surrounding area.

23.2.10 The assessment of potential socio-economic impacts uses, where relevant, policy thresholds or standards and professional judgment to assess the scale and nature of the impacts of the Project against baseline conditions. For socio-economics, there is no accepted definition of what constitutes a significant (or not significant) socio-economic effect. It is however recognised that effects are categorised based upon the relationship between the scale (or magnitude) of effect and the sensitivity (or value) of the affected resource or receptor.

23.2.11 As such, the socio-economic effects have been assessed on the basis of:

a. Consideration of sensitivity to impact: specific values in terms of sensitivity are not attributed to socio-economic resources/receptors due to their diverse nature and scale, however the assessment takes account of the qualitative (rather than quantitative) ‘sensitivity’ of each receptor and, in particular, their ability to respond to change based on recent rates of change and turnover (if appropriate);

b. Scale of impact: this entails consideration of the size of the impact on people or business in the context of the area in which effects will be experienced; and

c. Scope for adjustment or mitigation: the socio-economic study is concerned in part with economies. These adjust themselves continually to changes in supply and demand, and the scope for the changes brought about by the Project to be accommodated by market adjustment therefore requires consideration.

23.2.12 The assessment aims to be objective and quantifies effects as far as possible. However, some effects can only be evaluated on a qualitative basis. Effects are defined as follows:

a. Beneficial classifications of effect: indicate an advantageous or beneficial effect on an area, which may be minor, moderate, or major in effect;

b. Negligible classifications of effect: indicate imperceptible effects on an area;

c. Adverse classifications of effect: indicate a disadvantageous or adverse effect on an area, which may be minor, moderate or major in effect; and

d. No effect classifications: indicate that there are no effects on an area.

23.2.13 Based on consideration of the above, where an effect is assessed as being beneficial or adverse, the scale of the effect has been assigned using the below criteria:

a. Minor: a small number of receptors are beneficially or adversely affected. The effect will make a small measurable positive or negative difference on receptors at the relevant area(s) of effect;

b. Moderate: a noticeable number of receptors are beneficially or adversely affected. The effect will make a measurable positive or negative difference on receptors at the relevant area(s) of effect; and

c. Major: all or a large number of receptors are beneficially or adversely affected. The effect will make a measurable positive or negative difference on receptors at the relevant area(s) of effect.

23.2.14 Those effects which are found to be moderate or major are considered to be 'significant' and those which are minor or negligible are 'not significant'.

23.2.15 Duration of impact is also considered, with more weight given to reversible long-term or permanent changes than to temporary ones. Temporary impacts are considered to be those associated with the construction works. Long-term reversible impacts are generally those associated with the completed and operational development. For the purposes of this assessment, short term impacts are considered to be of one year or less, medium term impacts of one to four years and long-term impacts for five or more years.

Economic Impact

23.2.16 The following criteria have been set out to assess the effects on receptors in relation to employment and GVA which have been grouped together as economic impacts. **Table 23.3** identifies the sensitivity criteria that have been used to inform the assessment of socio-economic receptors relating to employment and GVA in conjunction with the magnitude criteria set out above to establish the significance of identified effects.

Table 23.3 Economic Impact Sensitivity Criteria

Sensitivity	Description
High	Businesses, workers or residents who have little or no capacity to experience impacts without incurring an economic loss or have capacity to experience an economic gain.

Sensitivity	Description
Medium	Businesses, workers or residents that have a moderate or average capacity to experience impacts without incurring a change in their economic well-being.
Low	Businesses, workers or residents that generally have adequate capacity to experience impacts without incurring a change in their economic well-being.
Negligible	Businesses, workers or residents that are unlikely to experience impacts on their economic well-being.

23.2.17 **Table 23.4** identifies the magnitude of impact criteria which have been used to assess the socio-economic receptors relating to employment and GVA.

Table 23.4 Economic Impact Magnitude Criteria

Sensitivity	Description
High	An impact that is expected to have considerable adverse or beneficial socio-economics effects. Such impacts will typically affect large numbers of businesses, workers or residents.
Medium	An impact that will typically have a noticeable effect of a moderate number of businesses, workers or residents, and will lead to a small change to the study area's baseline socio-economic conditions.
Low	An impact that is expected to affect a small number of businesses, workers or residents; or an impact that may affect a larger number of receptors but does not materially alter the study area's baseline socio-economic conditions.
Negligible	An impact which has very little change from baseline conditions where the change is barely distinguishable, approximating to a 'no change' situation.

23.2.18 The economic impact of the Project is considered relative to the North East Lincolnshire Local Authority area. This is considered a reasonable area in light of the likely time which workers will spend commuting to the Project and therefore represents the principal labour market catchment area. **Table 23.11** provides details on the definitions of study areas such as this which apply in this chapter.

23.2.19 Additionality has been calculated by considering the overall impact of job gains to the area, the level of leakage, number of displaced jobs and multiplier effects, such as supply chains and worker spending related jobs. These assumptions have been informed by the Homes and Communities Agency (HCA) Additionality Guidance (Ref. 23-1).

23.2.20 **Table 23.5** below outlines the values that have been allocated to the construction, operation, and decommissioning phases' additionality formula, enabling the tailored calculation of the net additional employment and economic impacts. Justifications for the values have been considered and are summarised in the right-hand column of the table.

Table 23.5. Calculation of employment generation assumptions

Additionality Factor	Value	Justification
Leakage (% of jobs that benefit those residents outside the Project's study area)	30%	Relating to employment from outside the study area – this is the proportion of jobs taken by people who live outside of the study area of North East Lincolnshire Local Authority Area.
Displacement (% of jobs that account for a reduction in related jobs in the Project's study area)	25%	For the purpose of this assessment, a low level of displacement (25%) has been assumed, in line with the HCA Additionality Guidance (Ref. 23-1).
Multiplier (further economic activity associated with the additional local income, supplier purchase and longer-term development effects)	1.5	The multiplier is a composite figure which takes into account both the indirect jobs created across the study area based on supply chain activity but also the induced employment created through increased spending across the study area. The HCA Additionality Guidance (Ref. 23-1) provides a 'ready reckoner' of composite multipliers. The study area is likely to have 'average' supply linkages and induced effects based on the scale of its economy. Therefore, a 'medium' multiplier of 1.5 is determined from the HCA guidance to be the most appropriate measure.

Public Rights of Way Impact

23.2.21 The following criteria have been set out to assess the effects on users of PRoW focussing on the impact of severance of existing routes and the resulting changes in journey lengths and times, and local travel patterns.

23.2.22 **Table 23.6** identifies the sensitivity criteria that have been used to inform the assessment of PRoW, in conjunction with the magnitude criteria set out above, to establish the significance of the identified effects.

Table 23.6 PRoW Impact Sensitivity Criteria

Sensitivity	Description
High	PRoW is of high importance with limited potential to substitute other route options for access to the wider network or community infrastructure.
Medium	PRoW is of medium importance with moderate potential to substitute other route options for access to the wider network or community infrastructure; or PRoW is of high importance with alternative routes available.
Low	PRoW is of low importance with alternative routes available; or

Sensitivity	Description
	PRoW is of very low importance with moderate potential to substitute other route options for access to the wider network or community infrastructure
Negligible	PRoW is of very low importance with alternative routes available.

23.2.23 **Table 23.7** identifies the magnitude of impact criteria which have been used to assess the impacts on PRoW.

Table 23.7 PRoW Impact Magnitude Criteria

Magnitude	Description
High	Substantial increase/decrease in journey length and/or travel patterns and increased/decreased opportunities for users to access the wider network and/or community infrastructure.
Medium	Noticeable increase/decrease in journey length and/or travel patterns and increased/decreased opportunities for users to access the wider network and/or community infrastructure.
Low	Slight increase/decrease in journey length and/or travel patterns and increased/decreased opportunities for users to access the wider network and/or community infrastructure.
Negligible	No increase or decrease in journey length and/or travel patterns and no increase or decrease in opportunities for users to access the wider network and/or community infrastructure.

Private Assets (residential properties, business premises, community facilities) Development Land, and Changing influx of workers Impacts

23.2.24 The following criteria have been set out to assess the effects on private assets comprising residential properties, business premises, community facilities, development land, and effects on resources from the influx of workers i.e. access to housing/accommodation and primary healthcare.

23.2.25 **Table 23.8** identifies the sensitivity criteria that have been used to inform the assessment of effects relating to these, which in conjunction with the magnitude criteria set out above, establish the significance of the identified effects.

Table 23.8. Private Assets and Development Land Impact Sensitivity Criteria

Sensitivity	Description
High	Private asset, development land or resource is of high importance and rarity with limited potential for substitution or access to alternatives

Sensitivity	Description
Medium	Private asset, development land or resource is of medium importance and rarity with moderate potential for substitution or access to alternatives.
Low	Private asset, development land or resource is of low importance and rarity with alternatives available.
Negligible	Private asset, development land or resource is of very low importance and rarity with alternatives available.

23.2.26 The magnitude of change to private assets and development land is assessed by appraising the level of impact on the receptor and the permanence of change arising from the Project. **Table 23.9** identifies the magnitude of impact criteria which have been used to assess the impacts on private assets and development land.

Table 23.9 Private Assets and Development Land Impact Magnitude Criteria

Sensitivity	Description
High	An impact that permanently affects the integrity and value of a private asset or development land or a resource or an impact that considerably enhances the value and quality of an amenity or land use.
Medium	An impact that negatively affects the value of a private asset or development land or a resource, but a recovery is possible with no permanent impacts; or an impact that improves key characteristics and features of the amenity or land use.
Low	An impact that negatively affects the value of a private asset or development land or a resource, but a recovery is expected in the short-term with no change to its integrity; or an impact that has some beneficial impact on the attributes of the private asset or development land.
Negligible	An impact which is a very minor loss or benefit from baseline conditions where the change is barely distinguishable, approximating to a 'no change' situation.

Significance Criteria

23.2.27 Socio-economic effects are a reflection of the relationship between the sensitivity of the affected receptor (**Table 23.3, Table 23.6** and **Table 23.8**) and the magnitude of the impact (**Table 23.4**, **Table 23.7**, and **Table 23.9**). The determination of significance is given in **Table 23.10**. Those effects which are found to be moderate or major are considered to be 'significant' (highlighted), and those which are minor or negligible are 'not significant'.

Table 23.10 Impact Assessment and Significance

Magnitude of Impact	Sensitivity of Receptor			
	High	Medium	Low	Negligible
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

Stakeholder Engagement

23.2.28 A range of stakeholders have been engaged as part of the scoping process to obtain their views on the Project and the scope of the Socio-economic assessment, the results of which are presented within the Scoping Opinion (**Appendix 1.A** of PEI Report Volume IV).

Limitations and Assumptions

23.2.29 The information presented in this preliminary assessment reflects that obtained and evaluated at the time of reporting. It is also based on an emerging design for the Project and the maximum likely extents of land required for its construction and operation.

23.2.30 The assessment of the significance of effects has been undertaken using a benchmark of current (2022) socio-economic baseline conditions prevailing at the Site and surrounding area, as far as is possible within the limitations of such a dataset.

23.2.31 Baseline data is subject to a time lag between collection and publication. As with any dataset, these conditions may be subject to change over time which may influence the findings of the assessment. Current datasets will be used wherever possible, including the 2021 Census. At the time of writing, only a limited number of datasets from the 2021 Census (i.e. demography and migration) have been published, however wherever possible, these are presented within the baseline analysis.

23.2.32 Baseline conditions reported in **Section 23.3** in regard to population and labour force and the local economy are based on latest data available at the time of writing. It is likely that the baseline conditions may have changed owing to the impact of the COVID-19 pandemic on the labour market, businesses and the economy. The assessment of effects reported in **Section 23.5** is based on latest available data and is considered adequate despite this limitation, and is not expected to affect the findings of this chapter. Construction and operational employment figures have been based upon professional judgement through experience of assessments undertaken on schemes which are similar in scale, sector and location to the Project. It is therefore assumed that approximately 700

construction workers would be required, of which, it is expected that 450 construction workers would be required on the landside and approximately 250 workers would be needed for marine side construction.

23.2.33 For operational employment, the number of workers required for operation of the Project is uncertain pending further workforce requirements modelling being undertaken. It has been assumed for this PEI Report, as indicated in **Chapter 2: The Project**, that a base level of operation would require 120 workers on the landside. The terminal will operate 24 hours a day, 7 days a week and 365 days a year (though with lower activity at night compared to the day), and will have capacity to accommodate up to 400 vessel calls per year, and it is anticipated that up to 12 of these calls will be associated with the hydrogen processing facility. These vessel numbers have been assessed as a worst-case scenario, in terms of potential environmental effects, in the relevant topic chapters of this PEI report. Therefore, operational staff numbers for the terminal on the marine side are likely to be up to 40, with at least some staff working to shift systems. This therefore results in a total operational workforce of 160. Actual employment is likely to be higher and as such the assessment of effects on operational employment represents a worst-case which will be revisited at the ES stage.

23.2.34 There are two PRoW within the Site boundary. Public Footpath 32 is assumed not to be affected by the Project as the only relevant work in this area is the underground pipeline corridor and it assumed that would be constructed using Horizontal Directional Drilling. Public Bridleway 36, which runs north from Laporte Road to the Humber, along the east edge of the Long Strip woodland, is assumed to be either temporarily diverted or closed during the construction phase of the Project. However, as a worst case scenario, it is assumed in this PEI Report, to be closed for the entire duration of the construction phase, with no diversion in place. This information will be refined for the ES as more detail on the phasing of the Project becomes available. Impacts on PRoW during the operational period have not been assessed as it is assumed that Public Bridleway 36 will be reopened as referred to in **Table 23.1**.

23.2.35 For the purposes of this assessment, it is assumed that in the majority of cases, access to private assets within the Site boundary would be lost for the duration of construction, operation and decommissioning periods, i.e. permanently. Some assets are expected to be able to remain open. Where this applies, these are identified in the assessment.

23.2.36 Effects resulting from the changing influx of workers (impact on primary healthcare facilities and accommodation facilities) during the construction, operation and decommissioning phases are based on assessments as to whether the current capacity can accommodate demand arising from the workforce created as a result of the Project.

23.2.37 It is recognised that there is potential for a cumulative effect on construction labour force availability if the construction period coincides with the construction of other Nationally Significant Infrastructure Projects in the Yorkshire and Humber region, either those approved, pending determination or in preparation. A list of possible Cumulative Schemes is provided in **Chapter 25: Cumulative and In-Combination Effects**.

23.2.38 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further through the assessment and consultation processes, and as further research and investigative surveys are completed to fully understand its potential effects.

Study Area

23.2.39 The impacts of the Project are considered at varying spatial levels according to the nature of the effects considered. This approach is consistent with HCA Additionality Guidance (Ref. 23-1).

23.2.40 The Scoping Report stated that the potential economic impacts arising from the Project would be considered relative to the Grimsby Travel to Work Area (TTWA). However, for the PEI Report, the North East Lincolnshire area has been used, which matches the baseline section of this assessment , ensuring that a consistent approach is taken. Data for the TTWA is also only available from 2011, however more recent data is available at the Local Authority level, representing a more current picture of the local economy. Further consideration will be given to the Grimsby TTWA data in the ES.

23.2.41 Effects on PRoW considers those resources likely to be affected by closures and diversions of routes. The study area therefore includes PRoW located in or within 500m of the Site boundary.

23.2.42 The principal impacts on private assets are assessed on a geographical scale. Direct impacts on these relating to land take and access are assessed based on the Site boundary and immediate vicinity. Impacts on these as a result of community severance are also assessed. In light of this, residential and business premises within the Site boundary or within 500m of it and community facilities within 1.5km of the Site boundary have been identified as being within the study area. Development land applications within the Site boundary or those within 500m of the Project boundary have also been considered.

23.2.43 The effects associated with the influx of new workers associated with the Project, considers receptors such as capacity at local primary healthcare facilities (GP surgeries) and accommodation facilities. Those located within 5km of the Site boundary have been considered in the assessment. **Table 23.11** below lists the socio-economic impacts by geographical area (study area).

Table 23.11 Socio-economic impacts by geographical scale

Impact	Geographical area of Impact	Rationale for Impact Area
Employment generation during the construction phase, operational phase and decommissioning phase (direct, indirect and induced impacts)	North East Lincolnshire Local Authority Area	Range of local centres included within the area and more current data available for this geography.

Impact	Geographical area of Impact	Rationale for Impact Area
GVA during the construction phase[1]		
PRoW	The Site and the land within 500m of the Site boundary.	Professional judgement of likely affected PRoWs and experience of other schemes during construction and decommissioning.
Private assets - residential properties	Properties within the Site and those located within a 500m radius from the boundary. This will be reviewed again at ES stage.	Professional judgement and location of sensitive receptors for impacts arising from the Project as informed by other assessments.
Private assets – business premises	Properties within the Site and those located within a 500m radius from the boundary. This will be reviewed again at ES stage.	Professional judgement and location of sensitive receptors for impacts arising from the Project as informed by other assessments.
Private assets - community facilities	Community facilities within 1.5km from the Site have been assessed. This will be reviewed again at ES stage.	Professional judgement and location of sensitive receptors for impacts arising from the Project as informed by other assessments.
Private assets - Development Land	The Site and immediately adjacent land	Professional judgement and experience of other schemes.
Changing influx of workers - Primary Healthcare	A radius of 5km from the Site	Professional judgement and experience of other schemes.
Changing influx of workers- Accommodation	North East Lincolnshire Area	Professional judgement and experience of other schemes

[1] Gross Value Added (GVA) is the measure of the value of goods and services produced in an area, industry or sector of an economy.

23.3 Baseline Conditions

Current Baseline

23.3.1 In order to assess the potential effects of the Project, the environmental conditions, resources and sensitive receptors that currently exist in the relevant study areas have been determined. These include:

a. The existing Site and land use, including development land;
b. Population and labour force;
c. The local economy;
d. PRoW;
e. Residential properties;
f. Business premises;
g. Community facilities;
h. Primary healthcare facilities (GP surgeries); and
i. Accommodation Facilities.

23.3.2 Potential effects arising from the Project are assessed relative to the baseline impact areas set out in **Table 23.11** and benchmarked against local, regional and national standards where appropriate. Therefore, baseline conditions have been provided for these areas.

Existing Site and Land Use, including Development Land

23.3.3 As set out in **Chapter 13: Landscape and Visual Impact**, the Project is located within an area characterised as an industrial landscape type for the areas surrounding the Port. Beyond the industrial landscape, the wider area is largely agricultural. Part of the Site forms a part of the operational Port and has been in active use for port purposes since 1912 and is currently used for bulk cargo, steel sections and lorry and automotive storage. If the Project is not built, it is assumed that those parts of the Site would continue to be utilised for these activities.

23.3.4 The Project is located nearby to Immingham town centre, which lies approximately 1km west of the Site boundary, and Grimsby town centre is located approximately 5km to the south east. The A1173 runs along the border of the west Site, which in turn connects to the A180, a dual carriageway.

23.3.5 The border of the east Site y runs alongside Queens Road and partially Kings Road. Laporte Road also crosses the Site for approximately 250m. A number of residential properties and commercial businesses located on the western side of Queens Road are included within the Site boundary as listed in **Chapter 2: The Project.** It is currently anticipated that the continued residential use of seven properties on the west side of Queens Road will need to cease, as residential use is unlikely to be compatible with the operation of the hydrogen production facility on the West Site. A number of businesses are also present in the same area on the west side of Queens Road. It is likely that those businesses are compatible with the operation of the hydrogen production facility. As part of HSE

advice associated with hazardous substances, consent application will determine if there are relevant impacts on these businesses. Whilst it is possible that powers to compulsorily acquire the properties or undertake appropriate works may be sought as part of the DCO, this is currently considered unlikely. The Applicant is currently in discussions with the landowners / occupiers of the seven residential properties with a view to negotiating their acquisition. Where it is not possible to acquire those properties through negotiation, acquisition powers for these properties will be sought through the DCO.

23.3.6 There is one extant planning permission affecting the western side of the Site (Ref. 23-9). This planning permission has already been implemented in relation to delivery of an access road, however, reserved matter approval has not been applied for in respect of the build development and subject to confirmation of the DCO, ABP do not intend to apply for such consent or build out the development which is authorised under this extant planning permission. Once the DCO is confirmed, ABP will be implementing the DCO and the hydrogen production facility will be delivered by AP on this land. There are two proposed employment site allocations included within the North East Lincolnshire 2018 Local Plan (Ref. 23-5) relating to land which falls within the Site boundary. These are ELR001 (also an enterprise zone) which is located on the western side of the Site and ELR025a, located at the north of the Site. On the border of the Site is site allocation ELR027, which is also a proposed employment allocation and enterprise zone.

Population

23.3.7 Within the North East Lincolnshire area, the population has reduced from 159,616 in 2011 to 156,900 in 2021 (or by 1.7%). This is lower than the increase of 3.7% recorded for the Yorkshire and the Humber and lower than the 6.3% increase recorded for England and Wales during the same time period (Ref. 23-24).

Employment

23.3.8 According to the Annual Population Survey (Ref. 23-12), the unemployment rate among working age residents in the study area in 2021 was 2.3%. This is lower than the rate recorded for Yorkshire and the Humber (3.5%) and for England (3.6%).

23.3.9 Residents of working age residing in the study area had an economic activity rate of 74.7%, which is lower than that recorded for Yorkshire and the Humber (77.3%) and for England (78.8%). This is shown in **Table 23.12**.

Table 23.12 Economic Activity and Unemployment Rates

Economic Indicator	Study Area	Yorkshire and the Humber	England
Economic activity rate for residents aged 16-64	74.7%	77.3%	78.8%

Economic Indicator	Study Area	Yorkshire and the Humber	England
Unemployment rate (for residents aged 16-64)	2.3%	3.5%	3.6%

Source: Office for National Statistics (2021), Annual Population Survey (Ref. 23-12)

Qualifications and Occupational Profile

23.3.10 In 2021, the Annual Population Survey (Ref. 23-12) showed that 23.6% of working age residents in North East Lincolnshire had a degree level qualification or higher (National Vocational Qualification [NVQ] Level 4+). This is notably lower than the rate recorded for Yorkshire and the Humber (37.9%) and for England (43.2%).

23.3.11 The proportion of residents in North East Lincolnshire with no qualifications (12.1%) is also considerably higher than recorded in Yorkshire and the Humber (7.8%) and for England and Wales (6.5%) (Ref. 23-12).

Deprivation

23.3.12 Based on the 2019 Indices of Multiple Deprivation (IMD), North East Lincolnshire is the 66th most deprived out of 326 local authorities nationally (1st being the most deprived and 326th being least deprived) (Ref. 23-13).

23.3.13 In all, 32 of the LSOAs within the borough are within the top 10% most deprived LSOAs in the country.

Local Economy

23.3.14 In 2020, the workforce of North East Lincolnshire comprised of approximately 66,000 employees. According to the most recent data on commuting patterns from the 2011 Census, a majority (70%) of the workforce in North East Lincolnshire also live in the area (Ref. 23-2).

23.3.15 **Table 23.13** presents a detailed breakdown of employment by broad industrial group in North East Lincolnshire, Yorkshire and the Humber and England and Wales. Based on the most recently available data from 2020 (Ref. 23-14) on employment by group, the highest levels of employment are recorded in Health (17.4%), Manufacturing (16.7%) and Retail (9.8%).

23.3.16 Specific to this assessment, the construction sector contributes 4.2% of employment within North East Lincolnshire. This is somewhat lower when compared to the percentage make up of Yorkshire and the Humber region's economy (5.2%) and England and Wales as a whole (4.8%).

23.3.17 In addition, the mining, quarrying and utilities broad industrial group (which includes employment from the generation of energy) comprises 1.4% of North Lincolnshire's employees. This is broadly in-line with the Yorkshire and the Humber region (1.3%) and England and Wales proportions (1.2%).

Table 23.13 Employee Jobs by Broad Industrial Group in 2020

Sector	North East Lincolnshire (%)	Yorkshire and the Humber (%)	England and Wales (%)
Agriculture, forestry and fishing	0.2	0.6	0.7
Mining, quarrying and utilities	1.4	1.3	1.2
Manufacturing	16.7	11.4	7.9
Construction	4.2	5.2	4.8
Motor Trades	2.8	2.0	1.8
Wholesale	3.0	4.0	3.8
Retail	9.8	8.8	9.3
Transport and Storage (including postal)	8.3	5.3	5.1
Accommodation and food services	6.1	6.3	7.2
Information and Communication	0.7	2.7	4.5
Financial and Insurance	0.9	2.9	3.5
Property	1.3	1.5	1.8
Professional, scientific and technical	4.5	6.8	8.8
Business, admin. and support services	8.3	9.7	8.8
Public administration and defence	2.1	4.6	4.4
Education	9.1	9.6	9.0
Health	17.4	13.7	13.3
Arts, Education, Recreation & other services	3.4	3.9	4.2

Source: Office for National Statistics (2020), UK Business Register and Employment Survey (BRES) (Ref. 23-14)

23.3.18 GVA is a measure of the value of goods and services produced in an area of the economy. Information on overall GVA per head is only available for both North and North East Lincolnshire combined, which, in 2020, was £22,497. This is broadly in-line with the Yorkshire and Humber average of £22,855, though significantly lower when compared to England as a whole, where GVA per head is £29,063 (Ref. 23-15).

23.3.19 For GVA per head in the construction industry specifically, the latest data available is from 2017 and also only available for North and North East Lincolnshire combined. At this time, the sector contributed £460 million to the local economy and consisted of 8,250 workers. The GVA per worker within the construction sector in North and North East Lincolnshire was therefore £55,757 (Ref. 23-27)

Public Rights of Way

23.3.20 The North East Lincolnshire Local Plan emphasises the importance of ensuring existing PRoW are kept open and minimal disruptions to PRoW are made during the construction process: *'Proposals that would result in the loss or reduction in quality or existing* Public *Rights of Way (PRoW) will not be permitted, unless acceptable equivalent alternative provision is made. Where diversions are proposed, these should be convenient and attractive to users and not increase disturbance on protected wildlife sites.'* (Ref. 23-6)

23.3.21 As described in the **Paragraph 23.3.3**, the Project is located within an area characterised as an industrial landscape type, but beyond this, the wider area is largely agricultural in nature. There are two PRoW routes on or abutting the Project.

23.3.22 There are two PRoW located within the boundary of the Project site, Public Bridleway number 36 (part of England's Coast Path, connecting Laporte Road to Grimsby) and Public Footpath number 32 (connecting Queens Road to the Redwood Industrial Park) (Ref. 23-16).

23.3.23 Public Bridleway number 36 is used predominantly for recreational purposes and forms part of a wider network of PRoW. It is understood that Public Footpath 32 is not in active use.

Residential Properties

23.3.24 The study area is mostly industrial and relatively sparsely populated with residential properties. The closest residential premises to the Project are located on the west side of Queens Road within the western side of the Site. This consists of a cluster of terraced properties and a detached dwelling, totalling seven dwellings. A large number of residential properties are also located approximately 500m to the west of the Site boundary on the edge of the town of Immingham.

Business Premises

23.3.25 There is a collection of small businesses on the western (or southern) side of Queens Road, which are within the Site boundary and these, so far has been determined to date, are listed in **Chapter 2: The Project**.

23.3.26 Within the Site boundary east of Laporte Road the site of the main proposed temporary construction area is an area of agricultural land which is currently used for arable farming and is assumed to form part of a larger agricultural business.

23.3.27 Further businesses are present surrounding Prince Edward and Prince Henry Drive, on the north-eastern side of Queens Road which consist of Painting and

Labour Services, Boyers Industrial Turning Services Ltd (engineers), Windsor Materials Handing (forklift truck rental business), Port Equipment Engineering Ltd (Engineers), Roxton Building Services (Builders), a laboratory, a takeaway business. These are outside of the Site boundary.

23.3.28 To the south-east of the Site boundary, there are industrial businesses which consist of Polynt Composites UK Ltd, a chemical plant on the border of the Site and PD Ports, a delivery company, approximately 70m away from the Site boundary. Kiln Lane Trading Estate is also located approximately 500m away from the Site boundary.

23.3.29 Both Queens Road Power Station (located to the east of the West Site) and Kings Road Power Station (to the west) are situated outside the Site boundary. Both power stations are operated by Sembcorp.

23.3.30 To the north-west of the Site are several businesses located approximately 200m away, which consist of shipping businesses, trucking companies, and HGV driver training. There is also a large manufacturing business located on the border of the Site.

Community Facilities

23.3.31 There are some community facilities located within 1.5km of the Site boundary, which includes a community recycling facility (located within the Site boundary but only within the pipeline corridor).

23.3.32 Within the town of Immingham, approximately 1km to the west are a range of different facilities including a veterinary practice, several sports facilities, petrol stations, large supermarkets, a variety of shops and a range of accommodation facilities.

23.3.33 Immingham East Fire Station is located within the Kiln Lane industrial estate, approximately 1km to the south of the Site.

23.3.34 The nearest open space is Homestead Park located within Immingham town centre, approximately 1.5km from the Site boundary.

23.3.35 There is one education facility located 1km west of the Site boundary. This is The Canon Peter Hall Church of England Primary School.

23.3.36 A border control facility is within the Site boundary but only within the pipeline corridor. It is understood that this facility has recently been completed and may become operational in future. The border control facility will be retained during the construction and operational phase of the Project.

Primary Healthcare- GP Surgeries

23.3.37 The reporting of the baseline primary healthcare provision is made with reference to guidance from the Royal College of General Practitioners, which recommends a GP:Patient ratio of 1:1,800 (Ref. 23-17).

23.3.38 The Site is located within the National Health Service (NHS) Humber and North Yorkshire Integrated Care Board [ICB] (which replaced Clinical Commissioning Groups in 2022). As of July 2022, this ICB had 1,775,158 registered patients (Ref. 23-18) and approximately 1,036 full time equivalent general practitioners

(FTE GPs) (Ref. 23-19). This equates to an average patient list size of 1,714 per FTE GP. This average list size at the ICB is thus lower than the target list size detailed above.

23.3.39 NHS General Practice Workforce data shows that there are two GP practices within 5km of the Site comprising a total of 17.9 FTE GPs. Given the industrial nature of the site location, there are not any practices within a typical walking distance of 1km. As shown in **Table 23.14**, there are a total of 34,974 patients registered at these practices. For identified practices taken as a whole, the GP:Patient ratio is 1:1,953, which is higher (i.e. worse) than the recommended ratio of 1:1,800. This is variable however, as the Roxton Practice (located approximately 1km from the Site), exceeds the recommended ratio by far. However, Killingholme Surgery (located approximately 4km from the Site) is below (i.e. better than) the recommended ratio set by the Royal College of General Practitioners (Ref. 23-19).

Table 23.14 GP Practices within 5.0km of the Site.

GP Surgery Name	Number of patients	Number of GPs (FTE)	Patients per GP (FTE)
Roxton Practice	33,452	16.5	2,027
Killingholme Surgery	1,522	1.4	1,087
Total*	34,974	17.9	1,953

Note: Figures may not sum due to rounding.

Source: NHS Digital (2022); General Practice Workforce (July 2022) and NHS Digital (2022); Patients Registered at a GP Practice (July 2022)

Accommodation Capacity

23.3.40 When last estimated in 2018 by Office for National Statistics, there were 15,440 privately rented homes in North East Lincolnshire (accounting for approximately 20.6% of the tenure mix). This compares to 48,762 owner occupied properties (65.2%) and 10,508 socially rented houses (14.1%) (Ref. 23-22). Although no area-based statistics are available, when last recorded by the English Housing Survey in 2020 (Ref. 23-25), nationally, 10% of private rented homes were vacant, noting that not all of these properties would be available for occupancy.

Future Baseline

23.3.41 In the absence of the Project, the future baseline is anticipated to be largely the same as the existing baseline for socio-economics. However, according to the ONS Population Projections, the population of North East Lincolnshire is projected to decrease from 159,996 in 2020 to 158,738 in 2040 which represents a decrease of -0.8%. In Yorkshire and the Humber and England as a whole, there is expected to be increases of +5.8% and +7.9% respectively (Ref. 23-21).

23.3.42 In terms of the local economy, the proportion of the population in North East Lincolnshire which is of working age is expected to reduce (from 59.7% in 2020

to 55.4% in 2040). This is however a similar picture reflected at both the regional (Yorkshire and Humber) and national (England) scale. Business and community facilities may open and close (especially given the proximity of the Site to an existing industrial area) including the proposed Immingham Eastern Ro-Ro Terminal (IERRT), construction of which is likely to commence in early 2025, with operation anticipated to begin in mid-2027. This is a new three berth Ro-Ro terminal at the Port of Immingham, to service the import and export of cargo. However, it is not expected that there would be any perceptible or material changes to the local economic baseline assessment and the Project should be assessed against current baseline conditions and policies. These changes are not considered to constitute significant changes to baseline conditions (Ref. 23-21).

23.4 Design, Mitigation and Enhancement Measures

Embedded Mitigation Measures

23.4.1 During the construction and decommissioning phases, there may be temporary impacts on users of PRoW if, as a worst case scenario, the Public Bridleway is closed for the entire period of construction and decommissioning works, with no diversion available. This will be reviewed at ES stage.

23.5 Potential Impacts and Effects

23.5.1 The preliminary assessment has identified that construction, operation and decommissioning have the potential to result in adverse and beneficial impacts and effects on socio-economics, which may be significant.

Construction

Employment during Enabling Works, Construction and Commissioning

23.5.2 Employment creation includes temporary employment opportunities, both directly at work sites and indirectly in the supply chain, arising from the construction of the Project.

23.5.3 The construction period is set out in detail in **Chapter 2: The Project** and is likely to extend over a ten year period. Therefore, employment generation during this phase will be of long term duration and represent a positive economic effect for a substantial period.

23.5.4 Employment requirements are established based on the type and nature of construction. It is assumed for the PEI Report that the construction of the Project will require on average 700 gross direct full-time employment (FTE), for both the marine and land side construction activities throughout the construction phase.

Leakage

23.5.5 Leakage effects are the benefits to those outside the economic impact study area, defined as North East Lincolnshire, as shown in **Table 23.5**. Analysis undertaken of the Census 2011 data indicates that 30% of people working in North East Lincolnshire live outside of the area (Ref. 23-2). This corresponds to

approximately a medium-high leakage rate as set out by the HCA Additionality Guidance (Ref. 23-1). This rate implies that, although a reasonably high proportion of employment opportunities will be retained in the effect area, a noticeable amount of jobs will be taken up by people living outside the impact area.

23.5.6 An adjustment of 30% has therefore been applied to the gross construction jobs to estimate the jobs created outside the target area. Thus, it is estimated that the construction period at the Project will create 490 jobs for residents within North East Lincolnshire and 210 jobs for residents outside of this area.

Displacement

23.5.7 Displacement measures the extent to which the benefits of a development are off-set by reductions in output or employment elsewhere. Any additional demand for labour cannot simply be treated as a net benefit since it has the potential to displace workers from other positions and the net benefit is reduced to the extent that this occurs.

23.5.8 Construction workers typically move between construction projects when delays occur or to help the workforce meet construction deadlines. Due to the flexibility of the labour market, construction labour force displacement has been assumed to be low.

23.5.9 The HCA Additionality Guide (Ref 23-1) provides standards (or 'ready reckoners') for displacement. Within the context of a construction project in the study area, a low displacement factor for 25% is considered appropriate according to the HCA. This factor is a best practice approach which is used in the absence of specific local information.

23.5.10 Applying this level of displacement to the total gross direct employment figure results in an estimated total net direct employment figure of 525 jobs per year during the construction period.

Multiplier Effect

23.5.11 In addition to the direct employment generated by the construction of the Project, there will be an increase in local employment arising from the indirect and induced effects of the construction activity. For example, employment growth will arise locally through manufacturing services and suppliers to the construction process (indirect or supply linkage multipliers). Additionally, it is assumed part of the income of the construction workers and suppliers will be spent in Immingham and the wider North East Lincolnshire area, generating further employment (in terms of induced or income multipliers).

23.5.12 The effect of the multiplier depends on the size of the geographical area that is being considered, the local supply linkages and income leakage from the area. The HCA Additionality Guide (Ref. 23-1) provides a 'ready reckoner' of composite multipliers - the combined effect of indirect and induced multipliers. This is a best practice approach in the absence of specific information that might provide a defensible justification for another multiplier effect level being used, appropriate to the sectors concerned. For the study area, a medium multiplier effect of 1.5 is

considered appropriate as it applies to a scenario with average linkages, and according to HCA additionality guidance is applicable to the majority of interventions.

23.5.13 Applying the 1.5 multiplier to the total net direct employment figure of 525 workers results in net indirect and induced employment of 263 jobs per annum during the construction period, together generating 788 total net jobs per annum.

Net Construction Employment

23.5.14 **Table 23.15** presents the temporary employment generated by the Project identified above, accounting for leakage, displacement and multiplier effects. The Project will support on average 788 total net jobs per annum during the construction period. Of these 552 jobs per annum will be expected to be taken up by residents within North East Lincolnshire, whilst 236 jobs will likely be taken up by workers living outside the region.

Table 23.15 Net Additional Construction Employment per annum from the Project:

	Study Area	Outside Study Area	Total
Gross Direct Employment	490	210	700
Displacement	-123	-53	-175
Net Direct Employment	367	158	525
Indirect and Induced Employment	184	79	263
Total Net Employment[2]	552	236	788

Source: AECOM Calculations 2022

23.5.15 The sensitivity of receptor is considered to be medium, taking into account the size of the construction worker labour pool in North East Lincolnshire (2,750) (Ref. 23-14). Factoring this in, the impact of the direct, indirect and induced construction employment generation in the study area has been assessed as medium. Therefore, the direct, indirect and induced employment created by the construction phase of the Project is likely to have a **moderate beneficial** effect on the North East Lincolnshire economy, which is considered **significant**. This is based on information available at the time of writing. A separate assessment of jobs that could be created by the Project, based primarily on assessment of

[2] Sum of Net Direct Employment and Indirect and Induced Employment

project-value, has concluded that at least 1,600 construction and operational jobs could be created in the wider supply chain. The ES will draw further on the separate assessment (and any updates to it), to define with greater certainty the jobs that are likely to be created in the construction phase.

Gross Value Added during the construction phase

23.5.16 GVA creation includes growth added through direct and indirect employment opportunities.

23.5.17 Applying the average GVA per construction worker in the area to the total number of construction workers generated from the Project gives the total GVA arising from the construction period.

23.5.18 As described in the baseline section, GVA estimations are only available for both North and North East Lincolnshire combined. The average GVA per worker for both areas in the construction sector was £55,757 in 2017 (Ref. 23-27, Ref. 23-14). By applying this figure to the total construction workers generated by the Project, it is estimated the construction phase will contribute nearly £44 million as an average to both economies, of which nearly £31 million is projected to remain within North East Lincolnshire; as shown in **Table 23.16.**

Table 23.16 Gross Value Added per annum from the Scheme during the construction phase

	North East Lincolnshire	Outside North East Lincolnshire	Total
GVA during the construction phase	£30,777,864	£13,158,652	£43,936,516

Source: AECOM Calculations 2022

23.5.19 The effect of GVA generation from the construction phase on North East Lincolnshire's economy has been assessed (given the medium sensitivity and medium magnitude of impact) to result in a **moderate beneficial** effect. This is considered **significant**.

Public Rights of Way (PRoW)

23.5.20 The effects on PRoW includes impacts on users of footpaths, bridleways, byways and National Cycle Routes from disruption to or diversion of journeys.

23.5.21 Changes to journey time, local travel patterns and certainty of routes for users would arise from the temporary closures and diversions of PRoW. Effects during construction on relevant routes are set out in the following paragraphs.

23.5.22 It is not possible to confirm with certainty the length of time each route will be closed for or the exact route of the provided temporary diversion, so as a worst-case scenario, it is assumed the affected PRoW will be closed for the entire length of the construction period, with no diversion in place.

23.5.23 It is understood that Public Footpath 32 is not currently in active use. This PRoW would also remain unaffected by the Project and would not need to be diverted.

Thus, as a result of no additional impact on users of this route, it is assessed that there would be **no effect** on this PRoW.

23.5.24 Temporary disruption to users making journeys on Public Bridleway 36 between Immingham and Grimsby would be experienced during the construction period. As a worst case scenario, it is assumed that part of the bridleway would be closed during the entire construction period, with no temporary diversion in place. This will be further assessed at ES stage. The impact from closure on users would be high. Given that the sensitivity of the receptor is medium this results in a **major adverse** effect, which is considered **significant**.

Private Assets

Residential Properties

23.5.25 As a result of the land use planning associated with hazardous substances, construction of the Project is assumed to require the permanent acquisition of residential properties located at 1 to 6 and 31 Queens Road. This would result in these properties ceasing to be residential. Although the number of properties makes up a relatively small proportion of stock in the local authority area, within the context of Immingham, and likely limited alternative supply, the loss is considered to represent an impact of medium magnitude. Therefore, at PEI Report stage, the effect on these residential properties during construction is assessed (given the high sensitivity of this receptor and medium magnitude of impact) to result in a **major adverse** effect, which is considered **significant**.

Businesses

23.5.26 Whilst the land use planning requirements may result in a number of businesses being unable to operate, this is considered unlikely. As a worst case scenario on a preliminary basis and for the purposes of assessment, it has been assumed that all of the businesses which are located within 7-30 Queens Road would be impacted. As detailed within **Table** , total employment at these businesses is estimated to be 82 jobs based on application of HCA Employment Density Guidance (Ref. 23-23). Actual employment at these businesses will likely vary, with this estimate considered to represent a reasonable worst-case, in the absence of this information.

Table 23.17 Existing Employment Calculations

Employment Floorspace Type	Floorspace (m^2)	Measurement	Jobs
General Office (Professional Services	761	GIA	53
Retail (High Street)	85	GIA	5
Light Industrial	795	GIA	15

Employment Floorspace Type	Floorspace (m^2)	Measurement	Jobs
Restaurants and Cafes	180	GIA	10
Total	1,821	GIA	82

Source: HCA Employment Density Guidance (2015) (Ref. 23-23)

23.5.27 The loss of these jobs would, on this worst-case basis, represent a medium impact. The effect of permanent displacement of these businesses and employment during construction is assessed (given the medium sensitivity of this receptor and medium magnitude of effect) to result in a **moderate adverse** effect, which is considered **significant**.

23.5.28 Construction of the Project will require approximately 3ha of temporary landtake from an agricultural business for a three year period. It is not currently known whether this would result in any loss of employment, though based on the extent of the land take, no significant effects are expected. A full assessment will be undertaken in the ES.

23.5.29 There is a border control post/facility which is located in the centre of the Site. This is within the pipeline corridor and would not be demolished. It is not currently operational, but is likely to become operational in the future. The building will remain in situ during the construction, operation and decommissioning and there would be **no effect** on this facility.

23.5.30 There are two Sembcorp Power Station sites on Queens Road and Kings Road. Access to these would be retained during construction, operation and decommissioning and therefore there would be **no effect** on these businesses.

Community Facilities

23.5.31 There is also one community facility, a community recycling facility which is located within the Site boundary. The facility and access to it will be retained and it will be able to continue operating during construction, operation and decommissioning. As such there would be **no effect** on this community facility.

Development Land

23.5.32 There is one extant planning permission affecting the western side of the Site (Ref. 23-9). This planning permission has already been implemented in relation to delivery of an access road, however, reserved matter approval has not been applied for in respect of the build development and subject to confirmation of the DCO, ABP do not intend to apply for such consent or build out the development which is authorised under this extant planning permission. Once the DCO is confirmed, ABP will be implementing the DCO and the hydrogen production facility will be delivered by AP on this land.

23.5.33 Part of the land within the Site is allocated within the North East Lincolnshire Local Plan for employment uses (and partially as an enterprise zone). As an employment use, the Project aligns with the allocation. Therefore, the impacts

arising from this on development land are assessed to be negligible, and the overall effect of the Project on the allocation is assessed as a **negligible** effect, which is **not significant**.

Impact of a changing influx of workers – primary healthcare

23.5.34 The principal impact arising from the changing influx of workers will be on local amenities, with the potential for impacts on primary healthcare provision being the most likely based on the number of workers required during construction of the Project.

23.5.35 It has been assumed that a total 700 workers would be involved in the construction period. Of these, 490 of are anticipated to reside within the North East Lincolnshire area all of whom can be assumed to be registered at local GP practices already. Therefore, there are likely to be an approximately 210 workers who are not currently registered at a local practice.

23.5.36 Taking a 'worst case scenario' approach, in which all of these construction workers register with local GP practices, this would increase the overall practice list size from 1,953 patients per GP to 1,965 patients per GP, which remains above, (i.e. worse than) the recommended GP:Patient ratio of 1:1,800, but not significantly higher than the current scenario.

23.5.37 It is therefore deemed that the Project will have a negligible magnitude of impact on primary healthcare facilities. Given the medium sensitivity of the receptor, this results in a **negligible** effect, which is considered **not significant.**

Impact of a changing influx of workers - accommodation

23.5.38 The private rented homes sector is considered to be the principal sector for accommodating demand for housing from 'non-home based' construction workers in an urban development context. When last estimated in 2018, there were 15,440 private rented properties in North East Lincolnshire. National data recorded in the English Housing Survey 2020 indicates that 10% of properties are vacant though not all would be available for occupancy. With no more local data available, applying this to the private rented housing stock in the local area, and taking a cautious approach and assuming that only half are available, there were an estimated 772 properties within North East Lincolnshire in 2018 that could potentially be available to construction workers.

23.5.39 As shown in **Table 23.15**, it is assumed that there would be approximately 236 workers involved in the construction phase who will be from outside the North East Lincolnshire area, and who may require accommodation on a temporary basis. It is anticipated that these workers could share accommodation on the basis of at least two workers per home, reducing the number of homes required. It is also acknowledged that some construction workers may not need temporary accommodation. Based on a worst case scenario whereby all 236 workers need accommodation on a two workers per rented property basis within the local authority area, the workers would require 118 homes in which approximately 772 are available, there is considered to be sufficient local supply to facilitate all construction workers being housed in accommodation. The impact magnitude is

therefore considered to be low. Given the medium sensitivity of the receptor this results in a **minor adverse** effect, which is considered **not significant**.

Operation

Existing employment

23.5.40 The assessment of employment creation has been included to reflect the creation of long-term employment opportunities, both direct and indirect, once the Project is operational including consideration of any existing employment uses on-site.

23.5.41 The Site is predominantly classed as industrial, and, as a worst case scenario, it is assumed (as described in **Paragraph 23.5.29 – 23.5.32**) that business premises located at 6-30 Queens Road within the Site boundary would be displaced along with any employment within these firms.

23.5.42 There is also a border control post (currently vacant but assumed to become operational in future), two power station sites and a community recycling facility located within or near the Site boundary, however, these will all remain in situ and are assumed to be operational throughout the construction and operational period of the Project.

23.5.43 As described in **Paragraph 23.5.26**, it is estimated that in total there are 82 permanent jobs which will be displaced as a result of businesses potentially ceasing operation, to enable construction and operation of the Project. This will be reviewed at the ES stage as further information becomes available on these businesses.

Total net operational employment

23.5.44 The number of operational workers created as a result of the Project is uncertain pending further workforce requirements modelling being undertaken. However, as stated in **Chapter 2: The Project**, the Applicant estimates the gross number of direct jobs to be generated by the fully operational Project is 160 jobs.

23.5.45 Assuming a leakage of 30% outside the North Lincolnshire area, a displacement of 25% and a 1.5 multiplier, it is estimated the Project would result in a net creation of an estimated 120 jobs, of which 84 would be within the North East Lincolnshire area. Accounting for the existing employment as outlined above, as a worst case scenario, the total net employment arising from the scheme would be 98 jobs of which 69 would be within the North East Lincolnshire area. This is presented in **Table 23.18**.

Table 23.18 Net employment of the proposed development in operation.

	North East Lincolnshire	Outside North East Lincolnshire	Total
Gross Direct Employment	112	48	160
Displacement	-28	-12	-40

	North East Lincolnshire	Outside North East Lincolnshire	Total
Net Direct Employment	84	36	120
Indirect and Induced Employment	42	18	60
Existing Employment	-57	-25	-82
Total Net Employment[3]	**69**	**29**	**98**

23.5.46 It should be noted that the actual number of jobs generated by the Project may be greater than those represented in **Table 23.18** as part-time staff will be created to perform maintenance and engineering works from time to time to ensure the Project is operational over a long period of time.

23.5.47 There are around 66,000 total jobs in North East Lincolnshire (Ref. 23-14). In this context and accounting for the additional net direct, indirect and existing employment associated with the Project, the impact of the operational employment generation on North East Lincolnshire's economy has been assessed to result in a low magnitude of impact. Given the medium sensitivity of effect, this is assessed to result in a **minor beneficial** effect, which is **not significant**.

23.5.48 As described in **Paragraph 23.5.43** the number of operational workers created as a result of the Project is currently uncertain and is based on information available at the time of writing. Actual employment is likely to be higher and as such this assessment conclusion represents a worst-case. A separate assessment of jobs that could be created by the Project, based primarily on assessment of project-value, has concluded that up to 750 operational jobs and at least 1,600 construction and operational jobs in the wider supply chain could be created. The ES will draw further on the separate assessment (and any updates to it), to define with greater certainty the jobs that are likely to be created in the operational phase. An updated assessment based on more detailed information on operational workforce numbers will be undertaken in the ES.

Private Assets

23.5.49 It is not anticipated that the operational phase of the Project will require further land from residential or private properties, businesses, community land and assets or from development land to that used during construction. As such there would be **no effect** on private assets arising during operation above those residential and business effects defined above.

[3] Sum of Direct Employment and Indirect & Induced Employment minus Existing Employment.

Changing influx of workers - primary healthcare

23.5.50 The principal impact arising from the changing influx of workers will be on local amenities, with the potential for impacts on primary healthcare of provision being the most likely based on the number of workers required during operation of the Project.

23.5.51 During the operational phase, there are an additional 160 workers estimated to be employed. Of these, 48 workers are expected to reside outside of the study area and so are unlikely to be registered at one of the local practices. Taking a 'worst-case scenario' approach, in which all of these workers register at local GP practices, it would increase the overall practice list size from 1,953 patients per GP to 1,956 patients per GP, which is only marginally higher (i.e. worse than) than current provision (although still in excess of the recommended GP:Patient ratio). It is therefore deemed that the Project would have a negligible impact on primary healthcare provision locally. Given the medium sensitivity of the receptor and low magnitude of impact, this results in a **minor adverse** effect, which is considered **not significant**.

Decommissioning

23.5.52 The impacts of the decommissioning period are predicted to be less than those experienced in the construction phase. This is because decommissioning would only involve the hydrogen production facility and not the marine facilities (these would continue to be maintained so that they can be used for port-related activities to meet long term need).

23.5.53 For the landside structures, the design life is around 25 years, although the operational life may be longer depending on commercial considerations.

23.5.54 Decommissioning of the hydrogen production facility would likely involve leaving underground pipelines in situ and making them safe. All above ground infrastructure would likely be dismantled and all material removed would be reused or recycled where possible or disposed of in accordance with relevant waste disposal regulations at the time of decommissioning and land restored to a satisfactory state. It is estimated that the decommissioning period for the hydrogen production facility would last for approximately two years.

Net Decommissioning Employment

23.5.55 Employment creation includes the creation of temporary employment opportunities directly at work sites and indirectly in the supply chain, arising from the decommissioning period associated with the Project.

23.5.56 Employment requirements for decommissioning activities are presently unknown Based on the assumption that the decommissioning activities will generate jobs, but will be considerably shorter in duration than construction, the impact magnitude is likely to be low. The sensitivity of the labour force is considered to be medium, resulting in a **minor beneficial** effect, which would be **not significant**.

Public Rights of Way

23.5.57 Potential effects on PRoW resulting from the decommissioning of the Project include impacts on users of footpaths, bridleways, byways and National Cycle Routes from disruption to, or diversion of, journeys.

23.5.58 Changes to journey time, local travel patterns and certainty of routes for users would arise from the temporary closures and diversions of PRoW. Effects during decommissioning on relevant routes are set out in the following paragraphs.

23.5.59 It is anticipated that due to the nature of decommissioning of hydrogen production facility only and the location of PRoWs, it would not be necessary for any PRoW to be temporarily or permanently diverted or closed.

23.5.60 As in the construction period, it is understood that Public Footpath 32 would remain unaffected by the Project during decommissioning and would not need to be diverted. Thus, as no additional impact on users of this route is anticipated, it is assessed that during decommissioning there would be **no effect** on this PRoW.

23.5.61 It is also assumed in the decommissioning phase that there would be a similar effect on Public Bridleway 36. As a worst case scenario, part of the bridleway will be closed for the entire period, with no diversion route available. Given the high impact and medium sensitivity of this receptor, this results in a **major adverse** effect, which is considered **significant**. This will be revisited at the ES stage as it is likely that decommissioning would require a much reduced working area compared to the construction of the Project.

Private Assets

23.5.62 It is not anticipated that the decommissioning phase of the Project will require further land from residential or private properties, businesses, community land and assets or from development land to that used in construction and operation and as such there would be **no effect** on private assets.

23.5.63 The final outcomes of the likely significant effects of the Project on socio-economics will be reported within the ES.

23.6 Residual Effects

Construction

23.6.1 Based on this preliminary assessment of socio-economic impacts, it is considered that there are likely to be residual significant effects associated with the construction period. These are construction employment generation (moderate beneficial), generation of gross value added (moderate beneficial), effects on residential properties (moderate adverse) and effects on businesses (moderate adverse).

Operation

23.6.2 Based on the current understanding of socio-economic impacts, it is considered that there are no residual significant effects associated with the operational period.

Decommissioning

23.6.3 Based on the current understanding of socio-economic impacts, it is considered that there are no residual significant effects associated with the decommissioning period.

23.6.4 The final outcomes of the likely significant effects of the Project on Socio-economics will be reported within the ES.

23.7 Summary of Preliminary Assessment

23.7.1 **Table 23.19** below outlines a summary of the preliminary assessment on Socio-economics.

Table 23.19 Summary of potential impact, mitigation measures and residual effects

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual effect	Confidence
Construction Phase					
North East Lincolnshire's economy	Employment generation during the construction phase	Medium	None required.	Moderate beneficial Significant	High
North East Lincolnshire's economy	GVA generation during the construction phase	Medium	None required.	Moderate beneficial Significant	High
Users of PRoW	Impacts on PRoW users during the construction phase	Minor	To be assessed at the ES stage.	Major adverse Significant	Medium
Private Assets	Loss of residential properties on Queens Road	Moderate	A full assessment will be undertaken at the ES stage, including the possibility of a compulsory acquisition process.	Major adverse Significant	Medium
	Permanent displacement of businesses on Queens Road	Moderate	A full assessment will be undertaken at the ES stage, including the possibility of a compulsory acquisition process.	Moderate adverse Significant	Medium
	Impacts on other: • residential properties.	No effect	None required.	No effect	High

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual effect	Confidence
	• business premises. • community facilities.				
Private Assets	Landtake of development land affecting the viability for future development of an employment allocation	Negligible	None required.	Negligible Not significant	High
Impact of a changing influx of workers	Impact on the capacity of local primary healthcare facilities.	Low	None proposed.	Negligible Not significant	High
Impact of a changing influx of workers	Impact on the capacity of local accommodation facilities.	Low	None proposed.	Minor adverse Not significant	High
Operational Phase					
North East Lincolnshire's economy	Employment generation during the operational phase	Low	None proposed.	Minor beneficial Not significant	High
Private Assets	Impacts on residential properties, business	No effect	None required.	No effect	High

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual effect	Confidence
	premises and community facilities.				
	Land take of development land affecting the viability for future development of the land allocation.	No effect	None required.	No effect	High
Impact of a changing influx of workers	Impact on the capacity of local primary healthcare facilities.	Low	None required.	Minor adverse Not significant	High
Decommissioning Phase					
North East Lincolnshire's economy	Employment generation during the decommissioning phase	Low	None required.	Minor beneficial Not significant	Medium
Users of PRoW	Impacts on PRoW users during the decommissioning phase	No effect	To be assessed at ES stage.	Major adverse Significant	Medium
Private Assets	Impacts on residential properties, business premises and community facilities.	No effect	None required.	No effect	High

23.7.2 The final assessment of the likely residual significant effects of the Project on socio-economics will be reported within the ES.

23.7.3 With regards to construction and operational employment, as explained in **Paragraphs 23.5.15 and 23.5.46**, this estimation is based on information currently available at time of writing. This will be further assessed as part of the ES, which may confirm increased direct and indirect employment opportunities, which in turn would create a larger positive benefit for the local economy.

23.8 References

Ref. 23-1 Homes and Communities Agency (HCA), (2014); Additionality Guide: A Standard Approach to Assessing the Additional Effect of Projects: 4th edition.

Ref. 23-2 Office of National Statistics (ONS); Census 2011.

Ref. 23-3 Department for Transport (2012), National Policy Statement for Port.

Ref. 23-4 Ministry of Housing, Communities and Local Government (2021), National Planning Policy Framework.

Ref. 23-5 Ministry of Housing, Communities and Local Government (2019), The National Planning Practice Guidance.

Ref. 23-6 North East Lincolnshire Council (2018), North East Lincolnshire Local Plan.

Ref. 23-7 North East Lincolnshire Council (2016), North East Lincolnshire Economic Strategy.

Ref. 23-8 North East Lincolnshire Council (2021), North East Lincolnshire Economic Recovery Plan.

Ref. 23-9 Greater Lincolnshire Local Enterprise Partnership (2016), Greater Lincolnshire LEP Strategic Economic Plan 2014-2030.

Ref. 23-10 North East Lincolnshire Council (2022), Online Planning Portal.

Ref. 23-11 Office for National Statistics (2020), Population Estimates – Local Authority based by five year age band.

Ref. 23-12 Office for National Statistics (2021), Annual Population Survey.

Ref. 23-13 Office for National Statistics (2019), The English Indices of Multiple Deprivation.

Ref. 23-14 Office for National Statistics (2020), UK Business Register and Employment Survey (BRES).

Ref. 23-15 Office for National Statistics (2020), Regional gross value added (balanced) per head and income components.

Ref. 23-16 North East Lincolnshire Council, Online Mapping

Ref. 23-17 Royal College of General Practitioners (2005); Information Note 20.

Ref. 23-18 NHS Digital (2022); Patients Registered at a GP Practice- July 2022.

Ref. 23-19 NHS Digital (2022); General Practice Workforce – July 2022.

Ref. 23-20 Co-Star (2022), Online Mapping: Property data,

Ref. 23-21 Office for National Statistics (2020), Population Projections, Local Authority based by single year of age.

Ref. 23-22 ONS (2018), Research outputs: Alternative estimates of subnational dwelling stock by tenure, England and Wales 2018.

Ref. 23-23 Homes and Communities Agency (2015), Employment Density Guide, 3rd Edition.

Ref. 23-24 Office of National Statistics; Census 2021.

Ref. 23-25 Department for Levelling Up, Housing and Communities (2021), English Housing Survey 2020 to 2021: headline report.

Ref. 23-26 HMSO (2012), National Planning Statement for Ports.

Ref. 23-27 Office for National Statistics (2017), Gross Value Added (Income Approach) by SIC07 industry at current basic prices.

23.9 Abbreviations and Glossary of Terms

Table 23.20 Glossary and Abbreviations

Term	Acronym	Meaning
Full Time Equivalent	FTE	A measure of the number of full time employees (or part time employees which add up to full-time employees).
Gross Value Added	GVA	A measure of the value of goods and services produced in an area, industry or sector of the economy.
National Health Service	NHS	The government funded medical and healthcare services in the UK.
Lower Layer Super Output Area	LSOA	Small areas designed to be of a similar population size, with an average of approximately 1,500 residents or 650 households.
Public Rights of Way	PRoW	A right by which the public can pass along linear routes over land at all times. Although the land might be owned by a private individual, the public have a legal right across that land along a specific route.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 24: Human Health and Wellbeing

Associated British Ports

Document History

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Table of contents

Plates

Tables

24 Human Health and Wellbeing

24.1 Introduction

24.1.1 This chapter presents the preliminary findings of the assessment of the likely effects of the Project on human health and wellbeing during the construction, operation and decommissioning phases. For more details about the Project, refer to **Chapter 2: The Project** of this Preliminary Environmental Information (PEI) Report.

24.1.1 The assessment draws on technical assessments across this PEI Report of relevance to human health and wellbeing and its wider determinants, including:

a. **Chapter 6: Air Quality;**

b. **Chapter 7: Noise and Vibration;**

c. **Chapter 11: Traffic and Transport;**

d. **Chapter 19: Climate Change;** and

e. **Chapter 23: Socio-economics.**

24.1.2 A number of other technical assessments across this PEI Report assess impacts of potential relevance to human health but have been scoped out of this assessment, as measures are expected to be established to manage risk and ensure there are no significant effects on human health. These aspects will be monitored during the preparation of the ES, and where potential health effects are identified, these will be considered in the human health chapter as relevant and appropriate:

a. **Chapter 18: Water Quality, Coastal Protection, Flood Risk and Drainage**; and

b. **Chapter 22: Major Accidents and Disasters**.

24.2 Approach to Assessment

Scope and Methods

24.2.1 A scoping exercise was undertaken in August 2022 to establish the form and nature of the human health and wellbeing assessment, and the approach and methods to be followed.

24.2.2 The EIA Scoping Report (**Appendix 1.A** of PEI Report, Volume IV) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria being applied in the assessment to identify and evaluate the likely significant effects of the Project on human health and wellbeing.

24.2.3 Following receipt of the Scoping Opinion, **Table 24.1** presents the requirements that will be taken into account as part of the ongoing Human Health and Wellbeing assessment:

Table 24.1: Summary of consultation undertaken to date for Human Health and Wellbeing

Consultee	Summary of Response	How comments have been addressed in this chapter
Planning Inspectorate	The effect of odour during operation has not been scoped into the assessment or reasons provided why this has been scoped out. This matter should be considered as part of the assessment made for air quality effects, as well as part of the health and well-being assessment, should significant effects be likely to occur.	An assessment of human health and wellbeing impacts arising from emissions of dust, noise, vibration and odours during the construction, operation and decommissioning phases of the Project is set in this Chapter and draws on assessments set out in **Chapter 6: Air Quality** and **Chapter 7: Noise and Vibration**. This is presented in **Table 24.12**.
Environment Agency	Emissions of dust, noise, vibration, and odours are only scoped in for assessment during construction and decommissioning. Odour during operation could potentially be an issue that needs to be scoped in; however, it may be appropriate to consider this under Chapter 5 Air Quality, as it does not appear to be covered elsewhere in the Report. The guidance that the Applicant will be expected to follow for environmental permitting can be accessed at Environmental permitting: H4 odour management - GOV.UK (www.gov.uk). We highlight the importance of the consideration of these issues in light of the close proximity of the residential properties mentioned under Chapter 3 above.	
Planning Inspectorate	The Scoping Report seeks to scope out this matter [PRoW impacts during operation] on the grounds that no adverse effects are expected as no direct effects are anticipated on public rights of way (PRoW) and no open space has been identified in the vicinity of the Proposed Development. Given the user experience of the PRoW during project operation would not be dissimilar to what it is currently, the Inspectorate agrees that this matter can	Noted. The effects of any impact on human health and wellbeing arising from impacts on PRoW during the construction and decommissioning phases is assessed in this Chapter and draws on the findings of **Chapter: 23 Socio-economics**. The health and wellbeing assessment is presented in **Table 24.13.**

Consultee	Summary of Response	How comments have been addressed in this chapter
	be scoped out of the assessment. See also impacts to PRoW during operation in Chapter 22: Socio-economics.	
Planning Inspectorate	The Scoping Report does not refer to potential local public concern through perception of risk from the transportation of hydrogen gas from the site. The Inspectorate considers that this matter should be scoped in to the assessment of human health and well-being.	An assessment of potential human health and wellbeing impacts arising from local public concern and perception of risk is set out below. The human health and wellbeing assessment is presented in **Table 24.15.**
UK Health Security Agency / Office for Health Improvement and Disparities	The scoping report does not make reference to the potential for local public concern through understanding of risk / risk perception. It should be noted that HyNet North West Hydrogen Pipeline Project has this potential impact scoped-in under 'Concern over hydrogen safety'. The effects related to people and communities in the near vicinity of the Project should be identified and addressed through targeted communications and mitigation programmes. For the wider public, general communication programmes in relation to the Project should provide a source of clear and objective information to increase knowledge and awareness. This approach has been accepted by PINS in the SoS Scoping Opinion.	
UK Health Security Agency / Office for Health Improvement and Disparities	The ES should consider potential effects on mental health through risk perception / understanding of risk posed by the handling and processing of hazardous materials. When estimating community anxiety and stress in particular, a qualitative assessment maybe most appropriate. Robust and meaningful consultation with the local community will be an important mitigation measure, in addition to informing the assessment and subsequent mitigation measures. This may involve conducting resident surveys but also information received through public consultations, including community engagement exercises. The Mental Well-being Impact Assessment Toolkit (MWIA) contains key principles that should be demonstrated in a project's community engagement and impact assessment. We would also encourage you to consult with the	

Consultee	Summary of Response	How comments have been addressed in this chapter
	local authority's public health team who are likely to have Health Intelligence specialists who will have knowledge about the availability of local data. The Mental Well-being Impact Assessment Toolkit (MWIA), could be used as a methodology. The assessment should identify vulnerable populations and provide clear mitigation strategies that are adequately linked to any local services or assets. Baseline indicators the assessment would benefit from including social cohesion/connectedness, satisfaction with local area and quality of life indicators owing to their established links to mental health and wellbeing. In terms of sources, we would draw your attention to the following: •PHE Fingertips –Mental Health and Wellbeing JSNA-Area profiles with various indicators on common mental disorders (including anxiety) and severe mental illness which can be benchmarked with other local areas as well as regional and national data •Office for National Statistics -Wellbeing Indicators-Range of datasets related to wellbeing available including young people's wellbeing measures, personal wellbeing estimates and loneliness rates by local authority.	
Immingham Town Council	The proximity of this hazardous site to existing premises seems too close.	An assessment of potential human health and wellbeing impacts of the Project on existing homes is assessed below, drawing on findings of **Chapter 6: Air Quality**, **Chapter 7: Noise and Vibration**, **Chapter 22: Major Accidents and Disasters** and **Chapter 23: Socio-economics**. This is presented in **Table 24.12** and **Table 24.15.**
UK Health Security Agency / Office for Health	Our position is that pollutants associated with road traffic or combustion, particularly particulate matter and oxides of nitrogen are non-threshold, i.e. an exposed population is likely to be subject to potential harm at any level and that reducing public exposure to non-threshold pollutants (such as particulate matter and nitrogen dioxide) below air quality standards will have	An assessment of potential human health and wellbeing impacts arising from air quality impacts during the construction, operation, and decommissioning phases of

Consultee	Summary of Response	How comments have been addressed in this chapter
Improvement and Disparities	potential public health benefits. We support approaches which minimise or mitigate public exposure to non-threshold air pollutants, address inequalities (in exposure) and maximise co-benefits (such as physical exercise). We encourage their consideration during development design, environmental and health impact assessment, and development consent.	the Project is set out below, drawing on **Chapter 6: Air Quality**. This is presented in **Table 24.12.**
UK Health Security Agency / Office for Health Improvement and Disparities	It is noted that the current proposals do not appear to consider possible health impacts of Electric and Magnetic Fields (EMF). We request that the ES clarifies this and if necessary, the proposer should confirm either that the proposed development does not impact any receptors from potential sources of EMF; or ensure that an adequate assessment of the possible impacts is undertaken and included in the ES.	An assessment of potential human health and wellbeing impacts arising from EMFs is scoped out of this assessment. No major sources of EMF are anticipated to arise from the Project. All cabling associated with the Project will be 132kV or below cables, and underground. The Applicant will ensure full compliance with relevant policies and procedures on EMF exposure limits are in place at the design phase. This will include ensuring worker exposure to any EMF risks are managed through adherence to standard working practices during any cable installation and commissioning works. Therefore, no impacts on human health and wellbeing are anticipated.
UK Health Security Agency / Office for Health Improvement and Disparities	The scoping report does not identify the approach to the identification of vulnerable populations. The impacts on health and wellbeing and health inequalities of the scheme may have particular effect on vulnerable or disadvantaged populations, including those that fall within the list of protected characteristics. The identification of vulnerable populations and sensitive populations should be considered. Baseline health data should be provided, which is adequate to identify any local sensitivity or specific vulnerable populations. The identification of vulnerable populations should be based on the list provided by the Welsh Health Impact Assessment Support Unit and the International Association of Impact Assessment (IAIA)	An assessment of the human health and wellbeing baseline, including analysis of health indicators among the population living locally, is set out below. The human health and wellbeing baseline includes data on population, age, ethnicity, deprivation, health deprivation, self-assessment of health, and a number of wider health determinant indicators. These indicators align with WHIASU vulnerable populations list (age related groups, income related groups, groups who suffer discrimination or other social advantage, geographical groups). Additional socio-economic data relating to the local population is set out in **Chapter 23: Socio-economics**.

Consultee	Summary of Response	How comments have been addressed in this chapter
UK Health Security Agency / Office for Health Improvement and Disparities	It is noted that Chapter 23 is drafted with reference to the Healthy Urban Development Unit (HUDU) and the Welsh Health Impact Assessment Support Unit (WHIASU) guidance and as such no assessment of significance is provided for human health. The lack of an assessment of significance does not conform to the requirements of The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (2017 Regulations) and as such an assessment of significance should form part of the Environmental Statement. HUDU and WHIASU are guidance to support health impact assessments and are not specifically designed to address health within an Environmental Impact Assessment (EIA). The ES must provide an assessment of significance for those health determinants scoped into the population and human health chapter. As there is currently not a defined approach to the assessment of significance for population and human health, it is strongly advised that any proposed approach is agreed with OHID/UKHSA and the local public health team. The guidance issued by the International Association of Impact Assessment (IAIA) could be used as a basis for the assessment of significance.	The assessment of human health and wellbeing impacts below uses Healthy Urban Development Unit (HUDU) guidance to carry out the assessment. A qualitative assessment is therefore made of whether effects are likely to be positive, negative or neutral with respect to health. Where negative effects are identified, suitable mitigation measures are identified. It is possible that where positive or negative effects are reported below, this could ultimately result in a significant effect with respect to health and wellbeing, but this will depend on further assessment. The final outcomes of the assessment, which will identify any likely significant effects of the Project on human health and wellbeing will be reported within the Environmental Statement and will take into account the latest IEMA guidance “Determining Significance for Human Health in Environmental Impact Assessment”, recently published in November 2022 (Ref 24-1).

Methodology

24.2.4 There is no industry-wide consolidated methodology or practice for the assessment of effects on human health. Best practice principles are provided in NHS England's Healthy Urban Development Unit's (HUDU) Rapid Health Impact Assessment (HIA) Toolkit 2019 (Ref 24-1). This guidance forms the basis of the approach adopted to assess impacts on health and wellbeing in this chapter. In addition, consideration has been given to the Health and Wellbeing checklist of the Wales Health Impact Assessment Support Unit (WHIASU) (Ref 24-3) to help with the identification of relevant health determinants. Based on this, the impacts of the Project on human health and wellbeing are assessed qualitatively using professional judgment and best practice, and drawing upon other assessments within the PEI Report. Therefore, the assessment does not follow the methodology for determining significant effects which is outlined in **Chapter 5: EIA Approach**. The methodology for the assessment is outlined below.

24.2.5 This qualitative assessment of human health effects considers the following health and wellbeing determinants of relevance to the Project:

a. Access to healthcare services and other social infrastructure;
b. Emissions of dust, noise, vibration, and odours;
c. Air/noise pollution linked with traffic;
d. Accessibility to open space, and on active travel;
e. Access to employment and training, particularly for local residents;
f. Contribution to social cohesion and engagement with existing communities to encourage social interaction and support mental health, including perception of risk; and
g. Climate change.

24.2.6 The assessment has considered the potential consequences for health and wellbeing from construction, operation, and decommissioning phases of the Project and draws upon the information and conclusions reported within the air quality assessment (**Chapter 6: Air Quality**), noise and vibration assessment (**Chapter 7: Noise and Vibration**), traffic and transport assessment (**Chapter 11: Traffic and Transport**), climate change assessment (**Chapter 19: Climate Change**), and socio-economic assessment (**Chapter 23: Socio-economics**).

24.2.7 There is no accepted definition of significance for health effects. The description of the changes to health determinants, the characteristics and sensitivity of the receptor population, and the likelihood of negative or positive health effects has been undertaken in accordance with HUDU and WHIASU guidance. The assessment provides qualitative information to inform stakeholders and decision makers of the likely direction of change in terms of human health and wellbeing outcomes. Therefore, in line with current knowledge and methods of assessment, the consideration of health outcomes reports effects as being positive, negative, or neutral, rather than indicating a level of significance.

24.2.8 The potential health effects during construction, operation, and decommissioning are described using the criteria outlined in **Table 24.2.** Where an impact is

identified, actions have been proposed to mitigate any negative impact on health, or to realise opportunities to create health benefits. It should be noted that in many cases, mitigation is embedded within the Project and the implementation of this is an underlying assumption of the assessment (see **Section 24.4.4**).

Table 24.2: Human health and wellbeing impact categories

Impact Category	Impact Symbol	Description
Positive	+	A beneficial impact is identified
Neutral	0	No discernible health impact is identified
Negative	-	An adverse impact is identified
Uncertain	?	Where uncertainty exists as to the overall impact

Legislation, Policy and Guidance

24.2.9 **Table 24.3** presents the legislation, policy and guidance relevant to the human health and wellbeing assessment and details how their requirements will be met assessment

Table 24.3: Relevant legislation, policy and guidance regarding human health and wellbeing

Legislation / Policy / Guidance	Consideration within the PEI Report
National Policy Statement for Ports (NPSfP)	
The National Policy Statement for Ports (NPSfP) (Ref 24-4) provides the framework for decisions on proposals for new port development. It is recognized that ports have a vital role in the import and export of energy supplies. It states that ensuring security of energy supplies through our ports will be an important consideration and that ports need to be responsible both to changes in the types of energy supplies needed and changes in the geographical pattern of demand for fuel. Within the document, it recognises that ports have the potential to affect the health, well-being and quality of life of the population through direct impacts on health and indirect impacts resulting from alterations to local populations. It highlights that these impacts can result from: Waste management Water quality and resources Air quality and emissions Noise and vibration Land use	Provides guidance on the likely impact pathways between port development and operation, and human health impacts. These align with the themes considered in the assessment of effects (**Section 24.6**) which, as set out in **Section 24.2**, considers: a) Access to healthcare services and other social infrastructure; b) Emission of dust, noise, vibration, and odours; c) Air/noise pollution linked with traffic; d) Accessibility to open space, and on active travel; e) Access to employment and training, particularly for local residents; and f) Contribution to social cohesion and engagement with existing communities to encourage social interaction and support mental health, including perception of risk.

Legislation / Policy / Guidance	Consideration within the PEI Report
Economic impacts, including access to public services.	
National Planning Policy Framework (NPPF)	
The latest National Planning Policy Framework (Ref 24-5) was published and adopted in July 2021. The NPPF consolidates the Government's economic, environmental and social planning policies for England into a single document and describes how it expects these to be applied. It provides overarching guidance on the Government's development aims. At the heart of the NPPF is a presumption in favour of sustainable development, which the Government states should be seen as a common theme running through plan-making and decision-taking. The NPPF states that the purpose of the planning system is to contribute to the achievement of sustainable development. The United Kingdom has agreed to pursue the 17 Global Goals for Sustainable Development in the period to 2030. These goals address social progress, economic wellbeing and environmental protection. The NPPF places emphasis on achieving sustainable development including by supporting *"strong, vibrant and healthy communities"*. Chapter 8: 'Promoting healthy and safe communities' outlines the key role that planning policy has in ensuring the health and wellbeing of communities through considerations such as the availability of school places, public safety and security, and the promotion of social interaction and community cohesion. Within this chapter, the NPPF identifies key principles that local planning authorities should ensure they consider in order to achieve this aim, including: Paragraph 92 c) which states policies should aim to *"enable and support healthy lifestyles, especially where this would address identified local health and well-being needs – for example through the provision of safe and accessible green infrastructure, sports facilities, local shops, access to healthier food, allotments and layouts that encourage walking and cycling"*; and Paragraph 93 b) which notes planning decisions should *"take into account and support the delivery of local strategies to improve health, social and cultural well-being for all sections of the community".* Paragraph 105 continues the theme of how planning policy, through the promotion of sustainable transport, can improve the health and well-being of the community. To achieve this objective, *"significant*	Provides guidance on the promotion of safe and healthy communities, which aligns with the themes considered in the assessment of effects (**Section 24.6**).

Legislation / Policy / Guidance	Consideration within the PEI Report
development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help reduce congestion and emissions and improve air quality and public health". Paragraph 130 demonstrates that well-designed places can improve the health and well-being of the local community. Planning policies and decisions should aim to *"create places that are safe, inclusive and accessible and which promote health and well-being, with a high standard of amenity for existing and future users; and where crime and disorder, and the fear of crime, do not undermine the quality of life or community cohesion".* Paragraph 185 illustrates that planning policies must conserve and enhance the natural and local environment and therefore, planning decisions on new developments should account for noise pollution. In doing so, planning policies and decisions should attempt to *"mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and quality of life".*	
NHS Long Term Plan (2019)	
The NHS Long Term Plan (Ref 24-6) sets out a ten-year programme of phased improvements to the NHS. The plan outlines how the NHS will attempt to reduce health inequalities through wider preventative action in deprived areas and improvements to integrated community-based care systems. This includes funding support to programmes which help to reduce smoking, obesity and air pollution in vulnerable communities. There will also be an increased focus on digital GP consultations to provide more options and better support for patients. Increases in NHS funding and the establishment of a new NHS Assembly are planned to help achieve better care quality and outcomes as well as helping to reduce workforce pressures. The NHS Long Term Plan stresses the importance of the NHS and the built environment sector continuing to work together to improve health and wellbeing.	Provides context to the assessment of the Project's impacts on access to local healthcare facilities, as set out in **Section 24.6**.
Health and Care Act (2022)	
In April 2022, the Government passed a new Health and Care Act 2022 (Ref 24-7). The new Act proposes health reforms in England, removes existing	Provides context to the assessment (**Section 24.6**) of access to local healthcare facilities (**Section 24.3**).

Legislation / Policy / Guidance	Consideration within the PEI Report
competition rules and formalises Integrated Care Systems (ICS). It also grants the health secretary authority over the health service. Previously ICS held an informal role and operated as shadow boards, however they now can be held accountable and are able to govern NHS finances at a local level. An ICS consists of two parts: the Integrated Care Board (ICB) and the Integrated Care Partnership (ICP). ICBs are responsible for NHS functions, have both a chief executive and chair and are accountable to NHS England for spending and performance. ICPs oversee the wider public and population health efforts. They have a broader focus and operate as a statutory committee between the ICB and each of the local authorities in the ICS area. ICS are described to be a key part of helping the NHS understand and respond to challenges at the local level, supporting people to get personalised care and seeking to ensure best value for public money. The Act also aims to support the development of ICS and integration of all health bodies, by requiring them to strive towards the collective aims of: better care for all patients; better health and wellbeing for everyone; and sustainable use of NHS resources. There are 42 ICSs across England (previously in April 2021, over 100 CCGS existed across the country) and each has been established with four strategic purposes: Improve population health and healthcare; Tackling unequal outcomes and access; Enhance productivity and value for money; and Helping the NHS to support broader social and economic development.	
Health and Social Care Act (2012)	
The Health and Social Care Act (Ref 24-8) was introduced following the Health and Social Care Bill, to safeguard the future of the NHS through modernisation. The Act intended to put clinicians at the centre of commissioning, free up providers, empower patients and give a new focus to public health. The document focused on the regulation of the NHS at the national and local level and set out the abolition of Primary Care Trusts (PCTs) and replacement of them with Clinical Commissioning Groups (CCGs). These have now been replaced in the 2022 Act with Integrated Care Systems (ICSs).	Provides context to the assessment (**Section 24.6**) of access to local healthcare facilities (**Section 24.3**).

Legislation / Policy / Guidance	Consideration within the PEI Report
Levelling Up the United Kingdom (February 2022) White Paper	
The Levelling Up the United Kingdom document (Ref 24-9) contains 12 specific missions which are set out as key objectives for the Government to deliver against. One of these missions includes that: *'By 2030, the gap in Healthy Life Expectancy (HLE) between local areas where it is highest and lowest will have narrowed, and by 2035 HLE will rise by five years'.* The goal is for the Government to tackle the existing disparities in health outcomes across the UK, ensuring that people have the opportunity to have long healthy lives wherever they live. It is stated that *'on average, people living in the most deprived communities in England have over 18 years less of their lives in good general health than those living in the least deprived areas'.* It is also recognised that COVID-19 has made disparities starker, with hospital admission and mortality rates higher among the more deprived groups. Early evidence has also suggested that self-reported 'long Covid' is also higher among those living in the more deprived areas. There also appear to be disparities in access to healthcare in the most deprived areas, with longer waiting lists in more deprived areas. The Government has also committed to increasing its programme of hospital building upgrades and to increase GP appointments. This is supported by investment in health and the NHS, part funded by the new Health and Social Care Levy. The UK government has also committed to maintaining the Public Health Grant in real terms, enabling local authorities to invest in prevention and front line services. The policy programme is focused around three key areas: Improving public health; Supporting people to change their food and diet; and Tackling diagnostic backlogs.	Provides context to stated governmental ambitions to reduce health disparities and provides justification for highlighting vulnerable groups and existing deprivation within the baseline conditions (**Section 24.3**).
Planning Practice Guidance (2019)	
The national Planning Practice Guidance (PPG) (Ref 24-10) was first produced in November 2016 and most recently updated in October 2019. It provides a web-based resource in support of the NPPF and offers guidance on health and wellbeing in planning and planning obligations. It covers both: The role of health and wellbeing in planning; and	Health and wellbeing impacts have been assessed in **Section 24.6**.

Legislation / Policy / Guidance	Consideration within the PEI Report
The links between health and wellbeing and planning. The PPG suggests that local authority planners should consult with the Director of Public Health on mitigation measures for any planning applications that are likely to have a significant impact on the health and wellbeing of the local population or particular groups. A health impact assessment is a useful tool to use when assessing expected significant impacts. The guidance states that: *"plan-making authorities may work with public health leads and health organisations to understand and take account of the health status and needs of the local population, including the quality, quantity of and accessibility to healthcare and the effect any planned growth may have on this. Authorities should also assess quality, quantity of and accessibility to green infrastructure, sports, recreation and places of worship including expected future changes, and any information about relevant barriers to improving health and well-being".* The PPG for health and safe communities covers the role of positive planning on healthier communities and how the design and use of the built and natural environments, including green infrastructure, are major determinants of health and wellbeing. The guidance states that *"planning and health need to be considered together in two ways: in terms of creating environments that support and encourage healthy lifestyles, and in terms of identifying and securing the facilities needed for primary, secondary and tertiary care, and the wider health and care system".* The PPG for open space, sports and recreation facilities, PRoW (Public Rights of Way) and local green space provides additional guidance on those designation and how they should be taken into consideration in planning. The guidance mentions that planning should consider proposals that may affect existing open space as they provide health and recreational benefits to people living and working nearby. It is for local planning authorities to assess the need for open space and, when doing so, should have regard to the duty to cooperate where open space serves a wider area.	
Public Health England Strategy 2020 to 2025	
The Public Health England Strategy 2020 to 2025 (Ref 24-11) sets out how the organisation will work to improve public health and reduce health inequalities. The key objectives for the next five years are quoted below:	Provides guidance on the relationship between the development of the built environment and health improvement priorities. The impact of the Project on health and wellbeing is assessed in **Section 24.6**.

Legislation / Policy / Guidance	Consideration within the PEI Report
"build and embed universal approaches to programme and project pipeline planning, reporting, and resource planning for use across Public Health England; improve governance structures around projects and programmes to support decision making, help identify barriers to progressing projects and ensuring that projects are properly evaluated throughout and closed when complete; and embed capacity planning within all programmes across Public Health England and, where relevant, agile approaches to bring greater flexibility and innovation to the work they do". The most relevant of the stated priorities are set out below: The most relevant of the ten priorities for focus of PHE over the next five years are set out below: '1) Smoke free society: take steps towards a smoke-free society by 2030; 2) Healthier diets, healthier weights: help make the healthy choice the easy choice to improve diets and rates of childhood obesity; 3) Cleaner air: Develop and share advice on how best to reduce air pollution levels and people's exposure to polluted air; 4) Better mental health: Promote good mental health and contribute to the prevention of mental illness; 5) Best start in life: work to improve the health of babies, children and their families to enable a happy, healthy childhood and provide the foundations of good health into adult life; 6) Effective responses to major incidents: Enhance the ability to respond to major incidents (including pandemic influenza), by strengthening our health protection system; 7) Reduced risk from antimicrobial resistance: work to help contain, control and mitigate the risk of antimicrobial resistance; 8) Predictive prevention: utilise technology to develop targeted advice and interventions and support personalised public health and care at scale; and 9) Enhanced data and surveillance capabilities: improve the data capability and strengthen the approach to disease surveillance using new tools and techniques. In 2020, Public Health England published 'Using the planning system to promote healthy weight	

Legislation / Policy / Guidance	Consideration within the PEI Report
environments'. This document provides strategic information on the use of the planning system to promote local healthy weight environments, supporting local businesses and workplaces to provide healthier food and drink to help enable people access to healthier food and active environments. Supporting healthy diets and a healthier weight is a priority in the PHE Strategic Plan 2020-2025. In 2017, Public Health England published 'Spatial Planning for Health: An evidence resource for designing healthier places', where the role of effective neighbourhood design for improving health outcomes was highlighted. The evidence presented in this report underpins the 2020 to 2025 strategy, with attention paid to the planning of housing, transport, and the natural environment in promoting good health.	
A Green Future: 25 Year Plan to Improve Our Environment (2018)	
The Government's 25-year Plan to Improve the Environment (Ref 24-12) outlines proposed action to protect the environment and economy simultaneously. Chapter 3 which focuses on government plans to improve the connection between people and the environment in order to promote health and wellbeing. This includes the following objectives: "*Helping people to improve their health and wellbeing by using green spaces"* – there will be a renewed reliance on green spaces to help address issues such as isolationism and loneliness, something which is becoming increasingly prevalent with an ageing population and increased reliance on technology. It will also help to tackle obesity and act as a preventative and therapeutic approach to mental health. Encouraging children to be close to nature, in and out of school, with a focus on disadvantaged areas. The government will launch 'Nature Friendly Schools Programmes' to help communities create *"the kind of school grounds that will support learning about the natural worlds and keep children happy and healthy".* There will also be greater support for pupil contact with local natural spaces by making it easier for schools to take pupils on regular trips.	Provides guidance on the relationship between the development of the built environment and health improvement priorities. The impact of the Project on health and wellbeing is assessed in **Section 24.6**.
Health Equity in England: The Marmot Review 10 Years On (2020)	
A follow up Marmot Review, Health Equity in England 10 Years On (Ref 24-13), was published in February 2020. The report highlighted the growth in health inequality over the preceding 10 years, especially for people living in more deprived districts and regions,	Provides context to stated governmental ambitions to reduce health disparities and provides justification for highlighting vulnerable groups and existing deprivation within the baseline conditions (**Section 24.3**).

Legislation / Policy / Guidance	Consideration within the PEI Report
and that for the population as a whole, health is declining. The report argues that greater levels of government intervention are required and that those areas who are most deprived should receive investment first and at higher levels. As well as this, it calls upon the Government to create a health inequalities strategy with clear targets and to create a Cabinet-level cross-departmental committee. It calls upon the government to re-order national priorities and to make wellbeing a central goal of policy, which will in turn create a better society, with better health and health equity.	
Build Back Fairer: The COVID-19 Marmot Review (2020)	
An update to the Marmot Review 10 Years On report, Build Back Fairer: The COVID-19 Marmot Review (Ref 24-14) was published in December 2020 to investigate how the pandemic has affected health inequalities in England. The COVID-19 pandemic has exposed and amplified the inequalities highlighted in the Marmot Review 10 Years On report. The report proposes that commitment to social justice and equity of health and wellbeing is at the heart of all policy-making, nationally, regionally and locally and that the economic harm caused by measures to control the virus may cause further damage to health and widening of health inequalities.	Provides context to stated governmental ambitions to reduce health disparities in the context of the COVID-19 pandemic, and provides justification for highlighting vulnerable groups and existing deprivation within the baseline conditions (**Section 24.3**).
The Marmot Review (2010)	
The Marmot Review (2010) (Ref 24-15) argues that serious avoidable health inequalities exist across England and shows these inequalities to be determined by a wide range of socio-economic factors. Health is linked to both individuals and communities. The following policy objectives are identified: "*Give every child the best start in life;* *Enable all children, young people and adults to maximise their capabilities and have control over their lives;* *Create fair employment and good work for all;* *Ensure a healthy standard of living for all;* *Create and develop healthy and sustainable places and communities; and* *Strengthen the role and impact of ill health prevention".*	Provides context to stated governmental ambitions to reduce health disparities and provides justification for highlighting vulnerable groups and existing deprivation within the baseline conditions (**Section 24.3**).

Legislation / Policy / Guidance	Consideration within the PEI Report
NHS England's Healthy Urban Development Unit (HUDU) Rapid Health Impact Assessment (HIA) Tool	
NHS England's HUDU HIA Tool (Ref 24-2) identifies eleven broad determinants of health that are likely to be influenced by specific development proposals and can be influenced through design and management measures. It provides an assessment checklist against which the likely impacts of new developments can be assessed.	The assessment of health and wellbeing is conducted in line with this guidance.
Wales Health Impact Assessment Support Unit (WHIASU) Health Impact Assessment (HIA): A practical guide	
WHIASU's guidance on HIA, including HIA: A practical guide (Ref 24-5), provides guidance on best practice approach to carrying out health impact assessment.	The assessment of health and wellbeing is conducted with regard to this guidance.
Joint Health and Wellbeing Strategy for Lincolnshire	
The role of the Lincolnshire's Health and Wellbeing Board is to bring together key people from the health and care system to work together to reduce inequalities and improve the health and wellbeing of the people of Lincolnshire. The Health and Wellbeing Board has identified a number of common aims which emerged during the engagement process which form the basis of the overarching aspirations and aims for the Joint Health and Wellbeing Strategy for Lincolnshire (Ref 24-16). These include the need for the Joint Health and Wellbeing Strategy to: Have a strong focus on prevention and early intervention; Ensure a focus on issues and needs which will require partnership and collective action across a range of organisation to deliver; Deliver transformational change through shifting the health and care system towards preventing rather than treating ill health and disability; and Focus on tackling inequalities and equitable provision of services that support and promote health and wellbeing.	Provides local policy context for the consideration of health and wellbeing in the population likely to be affected by the Project. An assessment of the health and wellbeing impacts arising from the Project on local populations is shown in **Section 24.6**.
North East Lincolnshire Local Plan 2013 to 2032	
The North East Lincolnshire Local Plan (Ref 24-17) sets out aspirations to address social inequality which may be caused by health disparities. The Plan makes reference to the development of the local authority	Provides local policy context for the consideration of health and wellbeing in the population likely to be affected by the Project. An assessment of the health and wellbeing

Legislation / Policy / Guidance	Consideration within the PEI Report
area and how this is likely to, or is able to, positively influence health outcomes. 'Policy SO5: Social and health inequality' addresses promoting healthier lifestyles and providing access to healthcare and community facilities.	impacts arising from the Project on local populations is shown in **Section 24.6**.
North Lincolnshire Local Development Framework	
The North Lincolnshire Local Development Framework (Ref 24-18) sets out aspirations to promote community health and wellbeing in the local authority area. Objective 8: Promoting Community Health and Wellbeing aspires to 'promote an improvement in health and wellbeing of North Lincolnshire's people by maintaining and providing quality open spaces, play and sports facilities, better access to the countryside and improved health facilities.	Provides local policy context for the consideration of health and wellbeing in the population likely to be affected by the Project. An assessment of the health and wellbeing impacts arising from the Project on local populations, including neighbourhood amenity and access to local facilities, is shown in **Section 24.6**.
Central Lincolnshire Local Plan	
The Central Lincolnshire Local Plan (Ref 24-19) adopted in April 2017 makes reference to health in the following policies: Policy LP9: Health and Wellbeing: this states that the potential for achieving positive and physical health outcomes will be taken into account when considering all development proposals; Policy LP13: Accessibility and Transport: this states that development proposals should contribute towards an efficient and safe transport network, where the use of sustainable transport modes are maximised; Policy LP15: Community Facilities: this states that all development proposals should recognise the community facilities as an integral component in achieving and maintaining sustainable, well integrated and inclusive development; Policy LP18. Climate Change and Low Carbon Living: this states that development proposals will be considered more favourably if the scheme would make a positive and significant contribution towards one or more of the following: reducing demand; resource efficiency; energy production; and carbon off-setting; Policy LP19: Renewable Energy Proposals: this states that proposals for non-wind renewable technology will be assessed on their merits, with the impacts considered against the benefits of the Scheme; and Policy LP20: Green Infrastructure Network: this states that the Central Lincolnshire Authorities will aim to maintain and improve the green infrastructure network	Provides local policy context for the consideration of health and wellbeing in the population likely to be affected by the Project. An assessment of the health and wellbeing impacts arising from the Project on local populations, including neighbourhood amenity and access to local facilities, is shown in **Section 24.6.**

Legislation / Policy / Guidance	Consideration within the PEI Report
by enhancing, creating and managing multifunctional green space within and around settlements that are well connected to each other and the wider countryside.	

Stakeholder Engagement

24.2.10 A range of stakeholders have been engaged as part of the scoping process to obtain their views on the Project and the scope of the human health and wellbeing assessment, the results of which are presented within the Scoping Opinion (**Appendix 1-A** of PEI Report, Volume IV), and have been taken into account with regard to the ongoing human health and wellbeing assessment.

Limitations and Assumptions

24.2.11 This assessment is based on baseline and Project design information obtained and evaluated at the time of reporting. A full assessment will be undertaken as part of the EIA and will be reported in the Environmental Statement (ES) that will be submitted with the Development Consent Order (DCO) Application.

24.2.12 The assessment of likely human health effects has been carried out against a benchmark of current human health and wellbeing baseline conditions prevailing around the Project, as far as is possible within the limitations of such a dataset. Baseline data is subject to a time lag between collection and publication. As with any dataset, these conditions may be subject to change over time which may influence the findings of the assessment. Baseline conditions reported in **Section 24.3** regarding human health and wellbeing are based on latest data available at the time of writing.

24.2.13 This assessment is based on professional judgment and considers both the adverse and beneficial impacts that the Project will have on the surrounding receptors. It provides an indication of human health and wellbeing effects on people and the local community.

24.2.14 Effects of human health and wellbeing during the construction, operation and decommissioning phases are based on preliminary assessments taking into consideration the results from the relevant environmental studies. These studies comprise **Chapter 6: Air Quality, Chapter 7: Noise and Vibration**, **Chapter 11: Traffic and Transport**, **Chapter 19: Climate Change**, and **Chapter 23: Socio-economics**. These will be further investigated and reported in the ES when completed assessments are available. The findings of the preliminary assessments in each of the respective chapters are subject to change as the design of the Project is developed and refined further, and further research and investigative surveys are completed to fully understand the Project's potential effects. However, the information available at the time of writing is sufficient to enable this preliminary assessment of the effect of the Project on human health and wellbeing.

24.2.15 The transport assessment (as set out in **Chapter 11: Traffic and Transport**) presents information obtained and evaluated at the time of reporting and is based

on the emerging design for the Project and the maximum likely extents of land required for its construction and operation. The traffic data used for the assessment is based on secondary data from surveys undertaken on behalf of the Applicant, but does not include data for Laporte Road which was unavailable and therefore this link has been excluded. An Automated Traffic Count is intended to be undertaken in advance of the preparation of the ES. An operational assessment has not been included as the traffic flows are significantly less than the construction phases.

24.2.16 The noise assessment methodology set out in **Chapter 7: Noise and Vibration** is based on the maximum likely extent of land required for the Project construction, operation and subsequent decommissioning. Detailed information about the construction programme is not yet available and therefore the noise assessment is regarded as indicative.

24.2.17 The air quality assessment methodology set out in **Chapter 6: Air Quality** is informed by the traffic data set out in **Chapter 11: Traffic and Transport** and is to that extent subject to the limitations and assumptions within that chapter (see also above). The assessment is informed by onsite emissions source characteristics and data available at the time of writing. Where there is uncertainty over operational emissions, precautionary assumptions have been made. With respect to vessel emissions data, actual emissions data is not known at this stage and an appropriate estimate of likely vessel emissions has been made. Meteorological data has been sourced from the nearest monitoring site which is 13km from the site. Where there is uncertainty about the exact location and dimensions of onsite buildings and structures, modelling has considered grouped, larger collective structures in order to undertake the assessment. In the absence of alternative data, Defra background data and Air Pollution Information Service (APIS) background data has been used to represent background pollutant concentration data in the study area.

24.2.18 This assessment has also considered the socio-economic assessment which has been carried out against a benchmark of current socio-economic baseline conditions prevailing around the Project, as far as is possible within the limitations of such datasets, as set out in **Chapter 23: Socio-economics**. Baseline data is subject to a time lag between collection and publication and, as with any dataset, these conditions may be subject to change over time which may influence the findings of the assessments. Additionally, it is not possible to confirm at this stage with certainty the length of time each PRoW may be closed, and as such the assessment is based on the worst-case assumption that PRoWs will be closed within the Site for the entire length of the construction and decommissioning periods, however this preliminary assessment will be refined in advance of the preparation of the ES. Finally, the assessment of the number of workers needed from outside the local area during the construction, operation, and decommissioning phases are based on assessments of whether current capacity can accommodate demand arising from the workforce created as a result of the Project.

24.2.19 The temporary impacts during construction are assessed as occurring simultaneously and for the programme set out in **Chapter 2: The Project**. The

same approach is assumed for decommissioning for the terrestrial parts of the Project. Whilst a phased construction (or decommissioning) programme may be possible, assuming a continuous 10 year construction duration means that the likely 'worst case' is assessed. This may result in the overestimate of predicted adverse health effects but is considered a robust approach to the assessment. Should the construction phase be extended or delivered in phases, as set out in **Chapter 2: The Project**, the predicted effects would be the same or less than those outlined in the chapter.

24.2.20 It is assumed that the jetty (the NSIP) would become part of the long- term port infrastructure and would not be decommissioned. Decommissioning of the terrestrial elements of the Project (the hydrogen production facility representing the Associated Development) is assessed as occurring after 25 years of operation and for the purposes of this assessment is treated as taking place no earlier than 2060, based on a 25-year design life. It is also possible that the hydrogen production facility will be operational for a longer period of time and or that certain elements of it may be decommissioned in advance of the main decommissioning phase and then the predicted effects would be the same or less than those outlined in this chapter. Similar to the construction period, the assessment of a ten year decommissioning period therefore represents a realistic worst case.

24.2.21 The findings of this preliminary assessment may be subject to change as the design of the Project is developed and refined further through the assessment and consultation processes, and as further research and investigative surveys are completed to fully understand its potential effects.

Study Area

24.2.22 The study area for the human health and wellbeing assessment varies by the type of impact being assessed:

a. The community human health and wellbeing baseline study area comprises an area of four local wards in which the Project is located in or in close proximity to. This includes: Immingham, and Wolds wards in North East Lincolnshire; Ferry in North Lincolnshire; and Yarborough in West Lindsey[1]. Where data is not available at the ward level, local authority level data is provided for North East Lincolnshire, North Lincolnshire, and West Lindsey.

b. The study areas for assessing the health and wellbeing impacts of the Project are influenced by the geographic extent of the relevant technical assessments. The assessment therefore refers to the study areas identified by the relevant technical chapters.

[1] Depending on the human health indicator being analysed, ward level data is available from the 2011 Census wards or 2018 electoral wards. Whilst the geographical extent of the 2011 Census and 2018 electoral wards differ, both extents provide an indication of local health in proximity to the Project and are therefore considered suitable for assessing the existing baseline conditions for human health. Where ward level data is not available, the local authorities of North Lincolnshire, West Lindsey, and North East Lincolnshire have been used as the study area referenced in the text.

24.3 Baseline Conditions

Current Baseline

24.3.1 This section describes the human health baseline environmental conditions within the human health and wellbeing study area, compared, where relevant, to wider geographical areas of the Yorkshire and the Humber region and England and Wales as a whole[2].

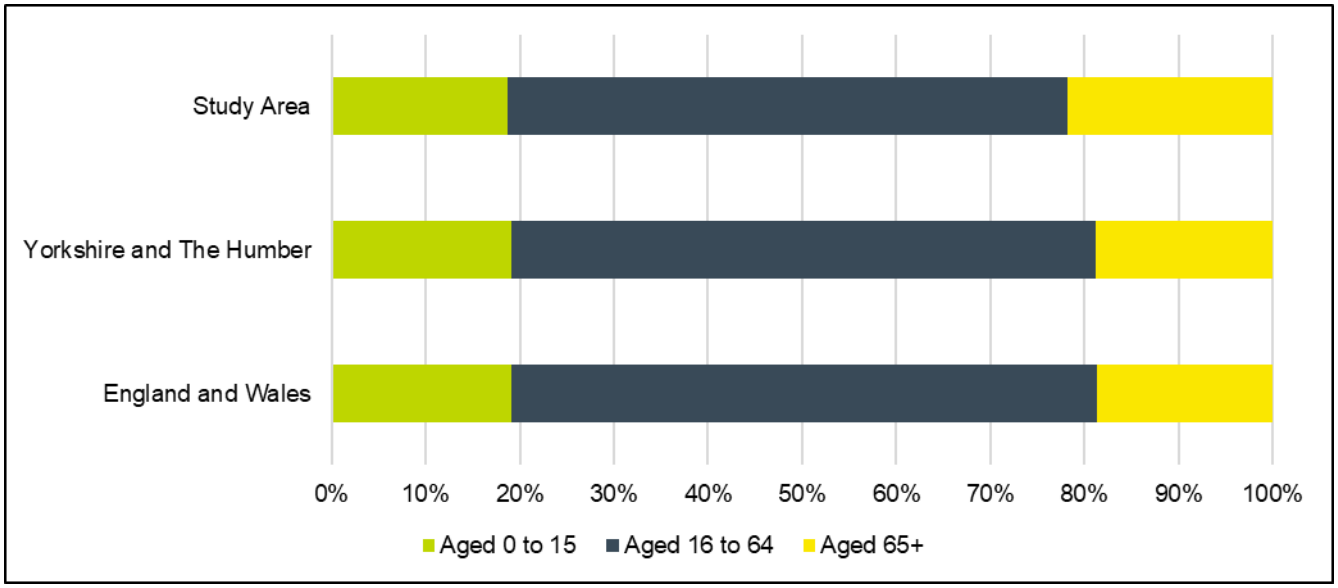
Demographic profile

24.3.2 The total population of the study area, according to mid-year population estimates in 2020, is 42,470, comprised of 11,485 in Ferry, 11,728 in Immingham, 7,700 in Wolds, and 11,557 in Yarborough (Ref 24-20).

24.3.3 In 2020, the average proportion of working age residents (aged 16 to 64) in the study area was 59.6% which is slightly lower than is typical for the Yorkshire and The Humber region (62.1%) and across England and Wales as a whole (62.2%). This is shown in **Plate 24-1**.

24.3.4 Additionally, the average proportion of residents aged 65 and over in the study area is 21.8%, which is slightly greater than is typical for the Yorkshire and The Humber region (18.9%) and across England and Wales as a whole (18.6%).

Plate 24-1: Age Breakdown by Geography



Source: Office for National Statistics, (2020); Mid-Year Population Estimates

24.3.5 The proportion of residents who self identify as of White ethnicity within the study area (98.5%) is far greater than is typical for the Yorkshire and The Humber region (88.8%), and across England and Wales (86.0%). Accordingly, the

[2] Data for the Yorkshire and the Humber region is presented for comparison purposes, and in order to contextualise the study area data, and thus does not form part of the assessment.

proportion of residents of other ethnic groups is below the equivalent regional and national rate. For example, whereas Asian/Asian British residents comprise 0.9% of the study area population, this ethnic group represents 7.3% of the population of the Yorkshire and Humber region, and 7.5% of the population of England and Wales. A breakdown of self-identified ethnicity within the study area, and regional and national averages is shown in **Table 24.4** (Ref 24-21).

Table 24.4: Ethnic Group by Geography

Ethnic Group	Study Area	Yorkshire and The Humber region	England and Wales
White	98.1%	88.8%	86.0%
Mixed/multiple ethnic groups	0.6%	1.6%	2.2%
Asian/Asian British	0.9%	7.3%	7.5%
Black/African/Caribbean/Black British	0.2%	1.5%	3.3%
Other ethnic group	0.1%	0.8%	1.0%

Source: Office for National Statistics, (2011); Census 2011.

Deprivation

24.3.6 The 2019 Indices of Deprivation (Ref 24-22) provide a set of relative measures of deprivation for local authorities and Lower Super Output Areas (LSOAs)[3] across England. The indices are comprised of a number of sub-domains of deprivation, including 'health'. An overall indication of deprivation of an area, appreciating all domains, is also reported. The local authorities which are included in the study area are North East Lincolnshire, North Lincolnshire and West Lindsey. North East Lincolnshire is the 66th most deprived local authority of 317 in England (where 1st is most deprived). North Lincolnshire is the 120th most deprived in England. West Lindsey is the 146th most deprived local authority in England.

24.3.7 Further detailed breakdown of indices of deprivation in each of the considered local authorities is given in **Table 24.5**. This shows that, in terms of overall deprivation, half of the LSOAs within North East Lincolnshire are ranked amongst the 30% most deprived LSOAs nationally. In North Lincolnshire the incidence of overall deprivation is lower as only approximately 30% (28%) of LSOAs are ranked among the 30% most deprived nationally. In West Lindsey 24% of LSOAs are ranked among the 30% most deprived nationally.

[3] Lower Layer Super Output Areas (LSOAs) are small geographical units designed to improve the reporting of small area statistics in England and Wales. Lower Layer Super Output Areas are built from groups of contiguous Output Areas and have been automatically generated to be as consistent in population size as possible.

24.3.8 Information is also provided in **Table 24.5** below regarding the incidence of deprivation in the health domain. It is shown that there is a high incidence of deprivation in the health domain in North East Lincolnshire whereby almost half (47%) of all LSOAs rank amongst the 30% most deprived LSOAs nationally. The equivalent incidence of deprivation in the health domain in North Lincolnshire is lower, whereby only 32% of LSOAs rank among the 30% most deprived nationally. In West Lindsey approximately 23% of LSOAs rank among the 30% most deprived nationally.

Table 24.5: Indices of Deprivation

Decile	Relative Deprivation	North East Lincolnshire		North Lincolnshire		West Lindsey	
		Overall Index of Depriv-ation	Health domain	Overall Index of Depriv-ation	Health domain	Overall Index of Depriv-ation	Health domain
0-10%	Most deprived	30%	15%	11%	11%	8%	4%
10-20%	↑	8%	17%	9%	8%	10%	0%
20-30%		12%	15%	8%	13%	6%	17%
30-40%		8%	10%	9%	12%	10%	13%
40-50%		5%	12%	15%	14%	13%	12%
50-60%		5%	15%	11%	25%	13%	15%
60-70%		12%	9%	15%	11%	12%	13%
70-80%	↓	7%	3%	11%	7%	8%	23%
80-90%		10%	2%	10%	0%	15%	2%
90-100%	Least deprived	3%	2%	3%	0%	6%	0%

Source: Ministry of Housing, Communities and Local Government, (2019); Indices of deprivation.

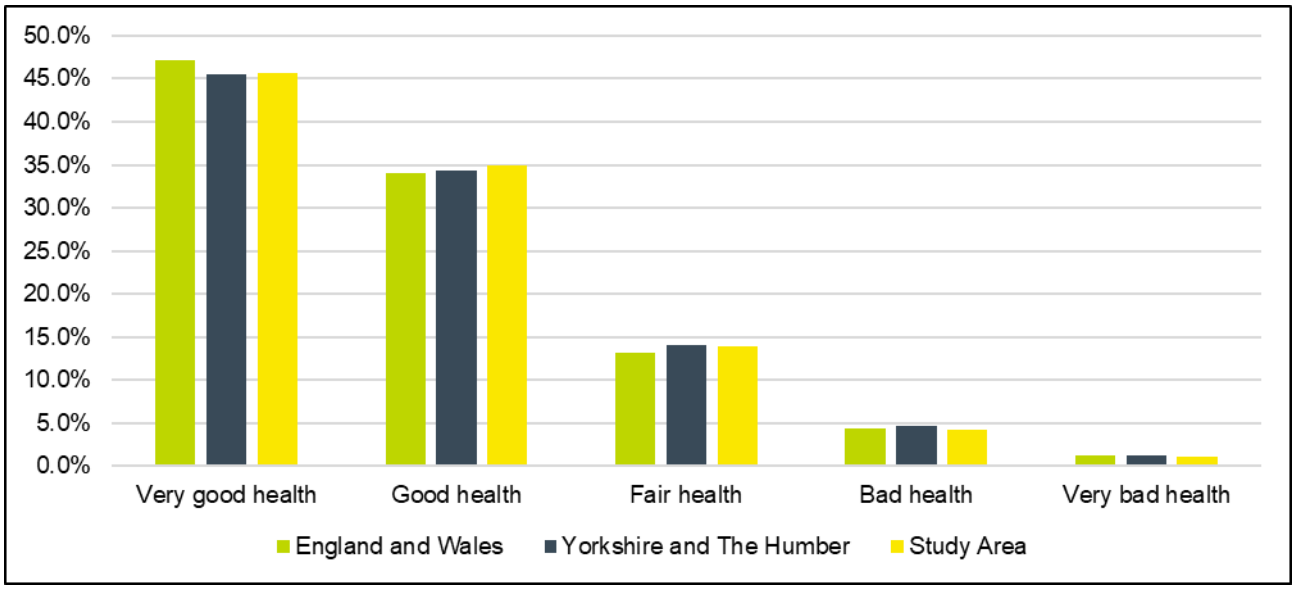
Health Profile

24.3.9 This section provides a human health profile of the study area, focussing on key determinants of health relevant to the assessment criteria provided within the HUDU/NHS England guidance (Ref 24-1). This local health baseline will be used to inform the assessment of potential health effects of the Project.

24.3.10 Based on 2011 Census data (Ref 24-21), which is the latest dataset available for self-assessment of health, 5.4% of residents of the study area consider their health to be ‘bad’ or ‘very bad’. This is broadly in line with the equivalent proportion of residents in the Yorkshire and The Humber region (6.0%) and

across England and Wales (5.6%). Self-reported health in each of the considered geographies is shown in **Plate 24-2**.

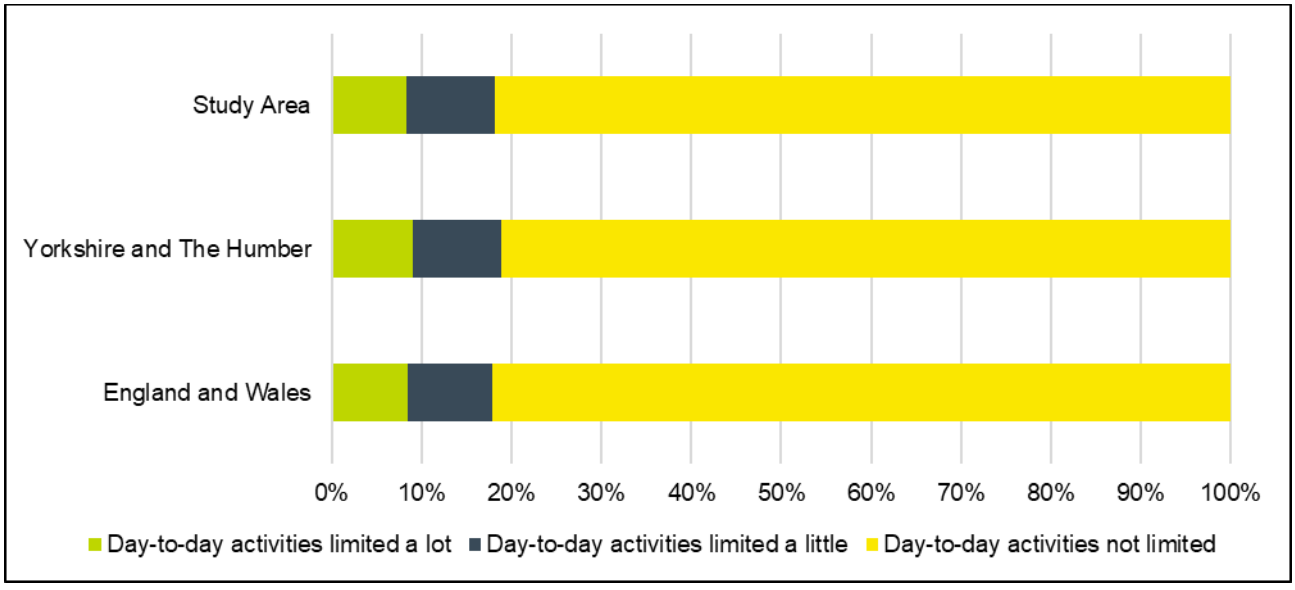
Plate 24-2: Self-assessment of Health



Source: Office for National Statistics, (2012); Census 2011.

24.3.11 Additionally, **Plate 24-3** illustrates a self-assessment of long-term health or disability, whereby a health problem limits a person's daily activities and has lasted at least 12 months. The proportion of residents within the study area who experience limitations to their daily activities arising from a long-term health condition or disability ('a little' or 'a lot') is 18.1%, which is broadly in line with the regional (18.8%) and national (17.9%) equivalent rates.

Plate 24-3: Self-assessment of Long-term Health or Disability



Source: Office for National Statistics, (2012); Census 2011.

24.3.12 Wider determinants of overall health can also provide insight into the health profile of an area. A number of indicators of health within the relevant local authority areas, derived from OHID (Office for Health Improvement and Disparities) data (Ref 24-23) and (Ref 24-24) is provided in **Table 24.6**. A comparison with regional and national data is also provided, where applicable. In summary:

a. Male and female life expectancies in North Lincolnshire and North East Lincolnshire are broadly in line with the regional average, albeit slightly lower than the national average. Male and female life expectancies in West Lindsey are higher than the regional and national average (Ref 24-23).

b. The under 75 mortality rates from all causes is lower in North Lincolnshire and West Lindsey than the regional average, although in North East Lincolnshire the rate is higher; this is also true when considering the under 75 mortality rates from cardiovascular diseases and cancer (Ref 24-23).

c. In terms of risk determinants, there is a higher prevalence of smoking in the relevant local authority areas than is recorded regionally and nationally. A similar proportion of adults are physically active in North East Lincolnshire and West Lindsey when compared to the region and England as a whole, yet in North Lincolnshire the proportion is notably lower. A higher proportion of adults are classified as overweight or obese within the considered local authority areas than across Yorkshire and The Humber, and England as a whole (Ref 24-23).

d. Health outcomes in the relevant local authorities exhibit worse incidence and prevalence than is typical of England. For example, there is a greater prevalence of CHD (coronary heart disease), a greater prevalence of stroke, a greater prevalence of heart failure, and a greater prevalence of chronic obstructive pulmonary disease (Ref 24-24). However, the incidence of tuberculosis is notably lower in the relevant local authorities compared to the national rate.

Table 24.6: Wider Determinants of Health

Determinant of health	Year	Age Range	Unit	North Lincolnshire	North East Lincolnshire	West Lindsey	Yorkshire and The Humber	England
Life expectancy at birth - male	2018 - 2020	n/a	Years	78.7	78.0	79.5	78.4	79.4
Life expectancy at birth - female	2018 - 2020	n/a	Years	82.7	82.2	83.4	82.2	83.1
Under 75 mortality rates from all causes	2018 - 2020	<75 yrs	No. per 100,000	367.7	387.0	309.2	372.7	336.5

Determinant of health	Year	Age Range	Unit	North Lincolnshire	North East Lincolnshire	West Lindsey	Yorkshire and The Humber	England
Under 75 mortality rates from all cardiovascular diseases	2017 - 2019	<75 yrs	No. per 100,000	72.2	92.0	66.3	80.2	70.4
Under 75 mortality rate from cancer	2017 - 2019	<75 yrs	No. per 100,000	136.9	152.6	125.8	137.5	129.2
Smoking Prevalence in adults (18+) - current smokers (APS)	2019	18+ yrs	%	17.8	16.5	15.5	12.9	12.1
Physically active adults	2020/21	19+ yrs	%	58.3	63.7	67.1	65.2	65.9
Adults (aged 18+) classified as overweight or obese	2020/21	18+ yrs	%	67.6	67.6	67.3	66.5	63.5
TB incidence (three-year average)	2018 - 2020	All ages	No. per 100,000	3.5	1.7	1.1	5.9	8.0
Estimated prevalence of CHD	2015	55 – 79 yrs	No. per 100,000	8.1	8.2	7.6	n/a	7.9
Estimated prevalence of stroke	2015	55 – 79 yrs	No. per 100,000	3.9	3.9	3.7	n/a	3.7
Estimated prevalence of heart failure	2015	>16 yrs	No. per 100,000	1.6	1.6	1.9	n/a	1.4
Estimated prevalence of COPD	2015	All ages	No. per 100,000	3.5	3.9	3.4	n/a	3.0

Source: Office for Health Improvements and Disparities, (2022); Local Authority Health Profiles. Office for Health Improvements and Disparities, (2022); Modelled Prevalence Estimates.

Healthcare Facilities

24.3.13 As detailed in **Chapter 23: Socio-economics**, the nearest hospitals (with an accident and emergency department) to the Project are St.Hugh's Hospital and Diana, Princess of Wales Hospital, located approximately 9km from the Project.

24.3.14 There are two GP surgeries within 5km of the Site: The Roxton Practice in Immingham and Killingholme Surgery in South Killingholme. The latest General Practice data (August 2022) published by NHS Digital (Ref 24-25) (Ref 24-26) indicates that these GP surgeries have a total of 17.9 GPs (FTE) and provides care to 34,974 patients. This corresponds to 1,953 patients per GP, which exceeds the Royal College of General Practitioners target (Ref 24-27) of 1,800 patients per GP.

Table 24.7: GP Surgery Patient List Size and Workforce

General Practice surgery	Number of patients	Number of GPs (FTE)	GP:Patient Ratio
The Roxton Practice	33,452	16.5	2,027
The Killingholme Surgery	1,522	1.40	1,087
Total	**34,452**	**17.9**	**1,953**

Source: NHS Digital, (2022); Patients Registered at a GP Practice – July 2022. NHS Digital, (2022); General Practice Workforce.

24.3.15 As set out in **Chapter 23: Socio-economics**, the GP surgeries shown in **Table 24.7** are within the NHS Humber and North Yorkshire Sub-ICB (Integrated Care Board) areas 03K and 03H. Information on the ratio of patients to GPs (FTE) is shown in **Table 24.8**. In both instances, it is shown that the ratio of patients to GPs (FTE) exceeds the Royal College of General Practitioners target of 1,800 patients per GP.

Table 24.8: Sub-ICB Patient List Size and Workforce

Sub-ICB	Number of patients	Number of GPs (FTE)	GP:Patient Ratio
NHS Humber and North Yorkshire ICB 03K	183,781	42.37	2,360
NHS Humber and North Yorkshire ICB 03H	172,095	40.11	2,493

Source: NHS Digital, (2022); Patients Registered at a GP Practice – August 2022. NHS Digital, (2022); General Practice Workforce.

Social Infrastructure

24.3.16 There is one primary school near to the Site. This is The Canon Peter Hall C of E Primary School located approximately 1km west of the site.

24.3.17 There is one police station in proximity to the site, located in Immingham, approximately 1.5km west of the site. Additionally, Immingham East Fire Station is located less than 1km from the site.

Community and Recreational Facilities

24.3.18 In addition to the social infrastructure facilities outlined above, there is a range of community and recreational facilities within the study area. **Table 24.9** illustrates these facilities and their distances from the site boundary.

Table 24.9: Community and Recreational Facilities

Receptor	Description	Approximate distance from red line boundary (km)
Community Recycling Facility	Utilities facility	<500m
Woodlands Sports Ground	Recreation facility	1.5km
Petrol Station	Community facility	1.0km
Immingham Fire Station	Community facility	1.0km
Large supermarket	Community facility	1.5km
Immingham East Fire Station	Emergency Services facility	1km
Homestead Park	Publicly accessible open space	1.5km
The Canon Peter Hall C of E Primary School	Primary school	1km
Eastfield Primary School	Primary school	1.5km
Killingholme Primary School	Primary school	5km
Goxhill Primary School	Primary school	11km
Keelby Primary Academy	Primary school	5.5km
Stallingborough C of E Primary School	Primary school	3km

Public Rights of Way

24.3.19 As set out in **Chapter 23: Socio-economics**, there are two PRoWs of relevance to the Project. These are shown in **Table 24.10**.

Table 24.10 Public Rights of Way within 500m of the Site

PRoW	Type	Approximate distance from red line boundary (m)
Public Bridleway 36	Bridleway – forms part of the recreational route known as England's Coastal Path (which was established as a National Trail in 2020)	0m
Public Footpath 32	Footpath	<100m

Residential Properties

24.3.20 As set out in **Chapter 23: Socio-economics**, the area is mostly industrial and relatively sparsely populated. The closest residential properties are located on Queens Road, which lie within the Site boundary in the western part of the Site. This consists of a cluster of terraced properties and a detached dwelling. A large number of residential properties are also located approximately 500m to the west of the Site boundary on the edge of the town of Immingham.

24.3.21 As explained in **Table 22.2** of **Chapter 22: Major Accidents and Disasters**, further assessment is required of the consequences of the operation of the hydrogen production facility on surrounding land uses in terms of major hazard planning. It is currently anticipated that the continued residential use of seven properties on the west side of Queens Road will need to cease, as residential use is unlikely to be compatible with the operation of the hydrogen production facility on the West Site. A number of businesses are also present in the same area on the west side of Queens Road. It is likely that those businesses are compatible with the operation of the hydrogen production facility. as part of HSE advice on the hazardous substance consent application will determine if there are relevant impacts on these buinesses. Whilst it is possible that powers to compulsorily acquire the properties or undertake appropriate works may be sought as part of the DCO, this is currently considered unlikely The Applicant is currently in discussions with the landowners / occupiers of the seven residential properties with a view to negotiating their acquisition. Where it is not possible to acquire those properties through negotiation, acquisition powers for these properties will be sought through the DCO.

24.4 Potential Impacts

24.4.1 The preliminary assessment has identified that construction, operation and decommissioning will potentially result in positive, neutral, and negative impacts on human health and wellbeing.

Construction

24.4.2 These impacts are associated with:

a. Access to healthcare services and other social infrastructure;

b. Emission of dust, noise, vibration, and odours;

c. Air/noise pollution linked with traffic;

d. Accessibility to open space, and active travel;

e. Access to employment and training, particularly for local residents;

f. Contribution to social cohesion and engagement with existing communities to encourage social interaction and support mental health including perception of risk; and

g. Climate change.

Operation

24.4.3 These impacts are associated with:

a. Access to healthcare services and other social infrastructure;

b. Air/noise pollution linked with traffic;

c. Access to employment and training, particularly for local residents;

d. Contribution to social cohesion and engagement with existing communities to encourage social interaction and support mental health, including perception of risk; and

e. Climate change.

Decommissioning

24.4.4 These impacts are associated with:

a. Access to healthcare services and other social infrastructure;

b. Emission of dust, noise, vibration, and odours;

c. Air/noise pollution linked with traffic;

d. Accessibility to open space, and on active travel;

e. Access to employment and training, particularly for local residents; and

f. Contribution to social cohesion and engagement with existing communities to encourage social interaction and support mental health, including perception of risk.

24.5 Design, Mitigation and Enhancement Measures

24.5.1 The Project has been designed, as far as possible, to avoid and minimise impacts and effects on health and wellbeing through the process of design development, and by embedding mitigation measures into the design.

24.5.2 Relevant design, mitigation and enhancement measures have been identified in the relevant related chapters (**Chapter 6: Air Quality, Chapter 7: Noise and Vibration, Chapter 11: Traffic and Transport, Chapter 19: Climate Change**, and **Chapter 23: Socio-economics**). No further design, mitigation and enhancement measures have been identified which are solely related to health and wellbeing.

24.6 Assessment of Effects

24.6.1 **Table 24.11** to **Table 24.16** below set out the potential health and wellbeing impacts associated with the Project during construction, once the Project is operational, and during decommissioning. The potential health and wellbeing impacts are described in accordance with the methodology as set out in **Section 24.2**.

24.6.2 In the tables below, the term 'n/a' indicates that an assessment of the health criteria is not applicable to a particular phase.

24.6.3 It is possible that where positive or negative effects are reported below, this could ultimately result in a significant effect with respect to health and wellbeing, but this will depend on further assessment. The final outcomes of the assessment, which will identify any likely significant effects of the Project on human health and wellbeing will be reported within the Environmental Statement and will take into account the latest IEMA guidance "Determining Significance for Human Health in Environmental Impact Assessment", published in November 2022 (Ref 24-1).

Table 24.11: Access to Healthcare Services and Other Social Infrastructure

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
Does the proposal assess the impact on healthcare services?	Yes (during construction, operation and decommissioning)	<u>During construction</u> As identified within **Chapter 23: Socio-economics**, the construction workers required to build the Project may place some demand on healthcare services temporarily if they move to the area during the construction phase, or if emergency treatment is required. The construction of the Project is anticipated to require an average of 700 workers during the construction period (although in practice the number will vary). Workers who reside locally already are likely to be registered at a practice currently and will therefore not be expected to place additional demand on local GP services. The current level of patients per GP located within 5km of the Project exceeds the recommended level. However, **Chapter 23: Socio-economics** concludes that additional demand arising from the Project would not be likely to significantly affect the current access to healthcare scenario in terms of GP:patient ratio and the effect on local healthcare would therefore be negligible. In terms of access to healthcare services, **Chapter 11: Traffic and Transport** assesses the potential impact of construction traffic on the local road network. Residents in villages surrounding the Project are likely to use the same strategic roads (including the A180, A160, and A1173) as construction traffic associated with the Project and workers attempting to access the Site. **Chapter 11: Traffic and Transport** concludes	**0** during construction **-** during operation **0** during decommissioning	<u>During construction</u> Implementation of measures set out in CTMP. <u>During operation</u> None recommended. <u>During decommissioning of the hydrogen production facility</u> Implementation of measures set out in a decommissioning plan prepared in accordance with the statutory requirements at the time.

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
		the presence of this additional traffic is expected to have negligible effects on severance, which will not be significant. It is therefore considered the Project is unlikely to affect local residents' ability to access healthcare facilities. A Framework Construction Traffic Management Plan (CTMP) will be secured through the DCO submission. The CTMP will set out any relevant mitigation measures to address potential severance impacts during the construction phase. Based on the above, the potential health impact on access to healthcare services during the construction period is assessed to be **neutral**. <u>During operation</u> As identified in **Chapter 23: Socioeconomics**, the operational employment associated with the Project, in a worst-case scenario that all workers register at a local GP practice, would be likely to have a minor adverse effect on local provision, which would not be significant. **Chapter 11: Traffic and Transport** sets out that during the operational phase local severance effects will be negligible and therefore will not be significant. Based on above, the potential health impact on access to healthcare services during the operational phase is assessed to be **negative**. <u>During decommissioning of the hydrogen production facility</u>		

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
		As identified in **Chapter 23: Socioeconomics,** the employment associated with the decommissioning of the Project is expected to be less than the construction phase, given that decommissioning will only be of the hydrogen production facility. Therefore, in a worst case scenario that all of the workers associated with this phase register at GP surgeries locally, the access to healthcare impact in terms of GP:patient ratio will be equal to or lower than that resulting from the construction phase. Therefore, the impact on access to healthcare during the decommissioning phase is expected to be negligible. This assumption is based on current levels of provision and it is likely that both provision of healthcare and registered patients will be different in future. **Chapter 11: Traffic and Transport** explains that traffic flows cannot be accurately forecasted for over 25 years in the future (noting that despite the 25 year operation period it is likely that certain elements of the Project will be operational for a longer period of time). However, the Project's impact on local residents' ability to access healthcare facilities in the decommissioning phase is expected to be the same or less as during construction, based on the expected similar number of trips and duration of these phases. Based on above, the potential health impact on access to healthcare facilities during decommissioning is therefore assessed to be **neutral**.		

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
Does the proposal assess the capacity, location, and accessibility of other social infrastructure, e.g. schools, social care and community facilities?	Yes (during construction, operation and decommissioning)	<u>During construction</u> Details of community facilities within the study area are set out in **Table 24.9**. In terms of capacity of services, as set out in **Chapter 23: Socio-economics** it is anticipated that construction workers will either already live within the local area, or will live temporarily within the area in temporary accommodation such as hotels (likely within Grimsby) during the construction phase. It is considered unlikely that a high proportion of workers will move to the local area with their families for the duration of the estimated 10 year construction period, and therefore there is unlikely to be an impact on the capacity of local social infrastructure. In terms of access to social infrastructure, as outlined above, **Chapter 11: Traffic and Transport** sets out an assessment of the likely impact of additional traffic on severance and concludes effects during the construction phase will be negligible (not significant). As above, a CTMP will be secured as part of the next stage of review, within the ES for the DCO. This will consider measures to manage construction traffic resulting from the Project in order to limit any potential disruptions and implications on the wider transport network, as well as for existing road users. Therefore, at this stage, the potential health impact on access to social infrastructure during the construction period is assessed to be **neutral**.	**0** during construction **0** during operation **0** during decommissioning	<u>During construction</u> Implementation of measures set out in CTMP. <u>During operation</u> None recommended. <u>During decommissioning of the hydrogen production facility</u> Implementation of measures set out in a decommissioning plan prepared in accordance with the statutory requirements at the time.

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
		<u>During operation</u> During the operational phase, there are expected to be 144 full time staff working within the Site boundary per day. These workers are expected to have a negligible impact on demand for social infrastructure (excluding healthcare) locally. **Chapter 11: Traffic and Transport** concludes that there will be negligible (not significant) effects in terms of severance during the operation phase. Therefore, the potential health impact on access to social infrastructure during operation is assessed to be **neutral**. <u>During decommissioning of the hydrogen production facility</u> **Chapter 11: Traffic and Transport** explains that traffic flow cannot be accurately forecasted for over 25 years in the future, however the Project's impact on local residents' ability to access social infrastructure in the decommissioning phase is expected to be the same as during construction, based on the expected similar number of trips and duration of these phases. The potential health effect on access to social infrastructure during the decommissioning phase is assessed to be **neutral**.		

Table 24.12: Air Quality, Noise and Neighbourhood Amenity

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
Does the proposal minimise construction impacts such as dust, noise, vibration, and odours?	Yes (during construction and decommissioning)	<u>During construction</u> An assessment of the risk of dust, site plant and NRMM emissions, vessel emissions and traffic emissions during the construction phase is provided in **Chapter 6: Air Quality** of the PEI Report. The assessment considers residual air quality effects on all sensitive receptors are unlikely to be significant. IAQM recommended mitigation measures will be implemented including: implementation of a stakeholder communications plan including community engagement before work commences on site; display of contact details of person(s) accountable for air quality and dust issues, and the head or regional office contact information on the site boundary; implementation of a Dust Management Plan (DMP); appropriate management of dust and air quality complaints; recording of exceptional dust and air quality emissions incidents; liaison with other high risk construction sites close by; daily inspections of receptors and other on- and off-site monitoring measures; measures to reduce impacts on sensitive receptors including appropriate site layout, screens and barriers; ensure vehicles comply with relevant emissions standards; and implementation of a Construction Logistics Plan (CLP); and, implementation of a Travel Plan to encourage travel to the site by means that reduce emissions. An assessment of the impact of the construction phase of the Project on noise and vibration is provided in **Chapter 7: Noise and Vibration**. It is assessed that following impact avoidance measures and additional noise specific measures, the noise	**-** during construction **n/a** during operation (see operational phase assessment below) **-** during decommissioning	<u>During construction</u> Implementation of IAQM recommended dust and particulate matter mitigation measures where appropriate, including implementation of a DMP, CLP and Travel Plan. Implementation of noise and other mitigation measures set out in the Construction Environmental Management Plan (CEMP). <u>During operation</u> **n/a** (see operational assessment below). <u>During decommissioning of the hydrogen production facility</u>

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
		effects at residential Noise Sensitive Receptors (NSRs) on Queens Road (in the worst case scenario that these properties remain during the construction phase). Based on above, the potential health impact resulting from construction impacts such as dust, noise, vibration, and odours is likely to be **negative**. <u>During operation</u> Not applicable as this assessment criteria refers to construction impacts (see operational assessment below). <u>During decommissioning of the hydrogen production facility</u> An assessment of the impact of the decommissioning of the Project on air quality has been scoped out of the assessment as no significant effects are considered likely, as set out in **Chapter 6: Air Quality**. An assessment of the impact of decommissioning of the Project on noise and vibration is provided in **Chapter 7: Noise and Vibration**. The assessment concludes that the impact of the decommissioning of the hydrogen production facility is likely to be similar to the construction period and therefore the assessment considers residual noise effects to be up to major adverse, which is considered significant. Therefore, the potential health impact resulting from the decommissioning impacts such as dust, noise, vibration, and odours is likely to be **negative**.		Implementation of noise mitigation measures.

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
Does the proposal minimise air pollution during the operational phase?	Yes (during operation)	<u>During construction</u> Not applicable as the assessment criteria refers to operational impacts. Air pollution impacts related to the construction phase are assessed above. <u>During operation</u> An assessment of the risk of onsite marine-side vessel emissions and landside combustion and process emissions, road traffic emissions and odour emissions impacts during the operation phase is provided in **Chapter 6: Air Quality.** The assessment concludes that the effects on human health sensitive receptors as a result of normal operation of the site, are likely to be negligible. Although a significant odour effect is considered to be unlikely, to demonstrate good practice and compliance with its Environmental Permit, an Odour Management Plan will be implemented. This will set out: odour control requirements beyond those incorporated in the Project design; best practice processes; appropriate responsibilities; and odour monitoring processes. <u>During decommissioning of the hydrogen production facility</u> Not applicable as the assessment criteria refers to operational impacts. Noise pollution impacts related to the decommissioning phase are assessed above.	**n/a** during construction **0** during operation **n/a** during decommissioning	<u>During construction</u> n/a <u>During operation</u> Implementation of Odour Management Plan. <u>During decommissioning of the hydrogen production facility</u> n/a
Does the proposal minimise noise pollution during the operational phase?	Yes (during operation)	<u>During construction</u> Not applicable as the assessment criteria refers to operational impacts. Potential health and wellbeing impacts arising from air pollution during the construction phase are assessed above.	**n/a** during construction **-** during operation	<u>During construction</u> n/a <u>During operation</u>

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
		<u>During operation</u> An assessment of the impact of operation of the Project on noise levels is provided in **Chapter 7: Noise and Vibration**. This sets out that, if unmitigated, there could be up to major adverse effects on homes on Queens Road, which is considered significant. It is assessed that minor adverse or negligible effects on homes on the eastern edge of Immingham could be expected, which is not considered significant. Mitigation measures for any significant noise effects in Immingham will be developed and reported in the ES. Part of this DCO is to request powers to acquire properties on Queens Road and therefore the noise assessment represents a worst case scenario. Therefore, the human health effect of the Project as a result of operational noise pollution is likely to be **negative**. <u>During decommissioning of the hydrogen production facility</u> Not applicable as the assessment criteria refers to operational impacts. Noise pollution impacts related to the decommissioning phase are analysed above.	**n/a** during decommissioning	Implementation of operational noise control scheme which would demonstrate use of best available techniques <u>During decommissioning of the hydrogen production facility</u> n/a

Table 24.13: Accessibility and Active Travel

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
Does the proposal prioritise and encourage walking (such as through shared spaces)?	Yes (during construction, operation and decommissioning)	<u>During construction</u> As set out in **Chapter 23: Socio-economics**, there are two PRoW within 500m of the Site boundary. Public Footpath 32 will be unaffected by the construction of the Project, therefore there will be no interruption of access or the ability to use this route for active travel, such as walking. It is assessed that in a worst case scenario, Public Bridleway 36 will be temporarily closed for the duration of the construction period. Due to the temporary loss of this PRoW in terms of accessibility for walking, , **Chapter 23: Socio-economics** concludes there will be a potential major adverse effect on users of PRoW during the construction of the Project, which is considered signficant, although a more detailed assessment will be undertaken at ES stage. As set out in **Chapter 11: Traffic and Transport**, it is concluded that during the construction phase (peak construction year) there will be no significant effects on pedestrian amenity, fear and intimidation, or highway safety. Based on above, the potential human health and wellbeing impact arising from potential impact on walking routes during the construction phase is assessed to be **negative**. <u>During operation</u> As set out in **Chapter 23: Socio-economics**, impacts on PRoW during the operational phase are considered to be	**-** during construction **0** during operation **-** during decommissioning	<u>During construction</u> Temporary diversion of Public Bridleway 36, resulting in no severance or journey time effects. <u>During operation</u> None required. <u>During decommissioning of the hydrogen production facility</u> None required.

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
		unlikely. An assessment of impacts on PRoW during the operational phase is therefore scoped out of the EIA. As set out in **Chapter 11: Traffic and Transport**, it is concluded that during the operation phase there will be no significant effects on pedestrian amenity, fear and intimidation, or highway safety. The potential human health and wellbeing impact arising from potential impact on walking routes during the operation phase is therefore assessed to be **neutral**. <u>During decommissioning of the hydrogen production facility</u> As set out in **Chapter 23: Socio-economics**, it is assessed that in a worst case scenario Public Bridleway 36 will be temporarily closed for the duration of the decommissioning of the hydrogen production facility. Thus, the impact on users of PRoW for active travel such as walking is assessed to be major adverse, which is significant, although a more detailed assessment will be undertaken at ES stage Therefore the potential human health and wellbeing impact arising from potential impact on walking routes during the decommissioning phase is assessed to be **negative**.		

Table 24.14: Access to Work and Training

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
Does the proposal provide access to local employment and training opportunities, including temporary construction and permanent end-use jobs?	Yes (during construction)	<u>During construction</u> An assessment of the number of jobs created during the construction phase is provided in **Chapter 23: Socio-economics**. It is estimated that the Project will support, on average, approximately 700 full-time employment construction jobs on Site during the construction period. Once leakage, displacement, and multiplier effects have been accounted for, this number rises to 788 net jobs during the construction period of the Project. Of these, 552 jobs will be expected to be taken up by residents within North East Lincolnshire. The implementation of local supply chain initiatives would maximise the potential for local benefits arising from the Project. For example making sure that local businesses have the opportunity to tender for appropriate contracts. Whilst some of the equipment is specialized and will not be sourced locally sourcing strategy will take account of commodities and services that can be sourced locally. The potential health and wellbeing impact arising from the local employment opportunities generated during the construction phase is therefore assessed to be **positive**. <u>During operation</u> As set out in **Chapter 23: Socio-economics**, there are currently a small number of existing jobs (approximately 82 FTE jobs) within the Site associated with the small	**+** during construction **+** during operation **+** during decommissioning	<u>During construction</u> Local employment benefits could be enhanced through local employment and training initiatives. <u>During operation</u> Relocation Strategy to support existing businesses displaced by the Project. Local employment benefits could be enhanced through local employment and training <u>initiatives. During decommissioning of the hydrogen production facility</u> Local employment benefits could be enhanced through local employment and training initiatives.

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
		businesses and potentially employment generating space on Queens Road. There is expected to be employment loss as a result of the Project associated with these businesses. **Chapter 23: Socio-economics** concludes this would be a significant adverse effect. An estimated 144 jobs will be directly generated by the Project when operational, which will potentially provide local employment opportunities in the form of permanent jobs. When existing employment activity and additionality effects are accounted for, the total net employment generated during operation is assessed to be 80 FTE jobs. As above, the implementation of local supply chain initiatives would maximise the potential for local benefits arising from the Project. For example, making sure that local businesses have the opportunity to tender for appropriate contracts. Whilst some of the services are is specialized a wide range of support services businesses already exist in the area. Supporting local procurement of new emerging businesses supporting new technology could include for example supporting local maintenance of fuel cell power vehicles. Given, the net additional jobs generated, the overall potential health and wellbeing impact associated with these additional employment opportunities is assessed to be **positive**. <u>During decommissioning of the hydrogen production facility</u>		

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
		An assessment of the number of jobs created during the decommissioning phase is provided in **Chapter 23: Socio-economics**. The assessment concludes that employment generated will be lower in magnitude and of a shorter duration than during the construction phase. Although it is not possible to state the amount of employment generated per annum, a proportion of employment will be expected to be taken up by residents within North East Lincolnshire. As above, the implementation of local supply chain initiatives would maximise the potential for local benefits arising from the Project. Whilst some of the equipment is specialized and will not be sourced locally sourcing strategy will take account of commodities and services that can be sourced locally. The potential health and wellbeing impact associated with the employment opportunities during decommissioning is assessed to be **positive**.		
Does the proposal include opportunities for work for local people via local procurement arrangements?	Yes (during construction, operation and decommissioning)	<u>During construction</u> An assessment of the number of jobs created during the construction phase is provided in **Chapter 23: Socio-economics** of the PEI Report. It is estimated that the Project will support, on average, approximately 700 full-time construction jobs per annum. Once leakage, displacement and multiplier effects have been accounted for, this number rises to 788 total net jobs per annum during the construction period of the Project. Of	**+** during construction **+** during operation **+** during decommissioning	<u>During construction</u> Implementation of local supply chain initiatives to support local businesses to benefit from opportunities arising from the Project. <u>During operation</u>

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
		these, 552 jobs per annum will be expected to be taken up by residents of North East Lincolnshire. The implementation of local supply chain initiatives would maximise the potential for local benefits arising from the Project. For example making sure that local businesses have the opportunity to tender for appropriate contracts. Whilst some of the equipment is specialized and will not be sourced locally, the sourcing strategy will take account of commodities and services that can be sourced locally. The potential health and wellbeing impact during construction should local procurement initiatives be implemented is assessed to be **positive**. <u>During operation</u> As above, the implementation of local supply chain initiatives would maximise the potential for local benefits arising from the Project. For example, making sure that local businesses have the opportunity to tender for appropriate contracts. Whilst some of the services are is specialized a wide range of support services businesses already exist in the area. Supporting local procurement of new emerging businesses supporting new technology could include for example supporting local maintenance of fuel cell power vehicles. The potential health and wellbeing impact during construction should local procurement initiatives be implemented is assessed to be **positive**.		Implementation of local supply chain initiatives to support local businesses to benefit from opportunities arising from the Project. <u>During decommissioning of the hydrogen production facility</u> Implementation of local supply chain initiatives to support local businesses to benefit from opportunities arising from the Project.

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
		<u>During decommissioning of the hydrogen production facility</u> As above, the implementation of local supply chain initiatives would maximise the potential for local benefits arising from the Project. The potential health and wellbeing impact during construction should local procurement initiatives be implemented is assessed to be **positive**.		

Table 24.15: Social Cohesion and Lifetime Neighbourhoods

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
Does the proposal consider health inequalities by addressing local needs through community engagement?	Yes (all phases)	<u>All phases</u> In response to the EIA Scoping Report issued in August 2022, the Planning Inspectorate (PINS) raised the potential mental health impact among local communities during the operational phase of the Project, arising from potential public safety concerns relating to the transportation of hydrogen via road within the local area. As explained in **Chapter 2: The Project**, liquid hydrogen will be produced on site. Liquid ammonia will be shipped to the jetty and then converted within the new production facilities into gaseous hydrogen which will then be turned into liquid through a hydrogen liquefier so it is easier to safely store and transport. With respect to potential public safety risks, **Chapter 22: Major Accidents and Disasters** sets out an assessment of safety risk and states that all risks will be mitigated to be As Low As Reasonably Possible (ALARP), all operations will be subject to authorisation by the Competent Authority (Health and Safety Executive (HSE) and Environment Agency (EA)), and all safety and regulatory requirements will be met in full, including obtaining of hazardous substance consent which will itself require local planning authority consent and will go through a local consultation process. In terms of public perception of risk, a statutory consultation, under the requirements of the Planning Act 2008, is being undertaken in January 2023-February 2023 to facilitate public	**-** during all phases	<u>All phases</u> Implementation of planned safety measures and public consultation. Operational phase Provision of information for inclusion in the local authority emergency plan

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
		understanding of, and listen and respond to questions about, the Project, including the hydrogen production process. This will include the sharing of Preliminary Environmental Information (in the form of this report and an accompanying non-technical summary which will explain this report in layman's terms). The consultation will also include: in-person consultation events (which will include materials setting out information about the proposed project, including safety and regulatory information), a public website and online consultation room; feedback forms, available both online and at in-person events; a freephone line; a postal address; and, an email address. This will ensure specific concerns are provided with a response. These consultation channels will be advertised to the consultation radius outlined in the Statement of Community Consultation. The channels available throughout the Statutory Consultation period will give the public many opportunities to raise questions and concerns. The website, phone line, postal address, and email address will continue to be monitored outside of these dates, however comments shared after 20 February 2023 will be noted but may not be able to be taken into account as part of the Statutory Consultation period. Further details are set out in the Statement of Community Consultation. The Project will operate in line with best practice with regard to safety, and significant public information will be made available to respond to queries on the safety aspects of the Project. However, given perception and mental health are by their nature subjective, it is possible there could be **negative**		

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
		impacts on local mental health arising from safety concerns during all phases of the Project.		
Does the proposal connect with existing communities, i.e. layout and movement which avoids physical barriers and severance, and land uses and spaces which encourage social interaction?	Yes (during construction, operation and decommissioning)	<u>During construction</u> As set out in **Chapter 23: Socio-economics**, it is assessed that in a worst case scenario, there will be a significant effect on PRoW during the construction phase, and therefore it is assessed that there will be a human health and wellbeing impact in terms of severance of pedestrian routes that connect existing communities such as Immingham and Grimbsy. This preliminary assessment is to be refined at ES stage. As set out in **Chapter 11: Traffic and Transport**, it is concluded that during the construction phase (peak construction year of 2025) there will be no significant effects on severance, pedestrian amenity, fear and intimidation, or highway safety. A CTMP will be prepared as part of the next stage of the application process, as part of the Environmental Statement. This will consider measures to manage construction traffic resulting from the Project at peak hours in order to limit any potential disruptions and implications on the wider transport network as well as for existing road users. Therefore, there is forecast to be limited impact on pedestrian and cyclist facilities during construction. The likely health impact arising from impacts during the construction phase would therefore be **negative**.	**-** during construction **0** during operation **-** during decommissioning	<u>During construction</u> Implementation of measures set out in CTMP. <u>During operation</u> None required. <u>During decommissioning of the hydrogen production facility</u> None required.

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
		<u>During operation</u> As set out above, **Chapter 11: Traffic and Transport** concludes no significant severance effects are anticipated during the operational phase. In addition, no impacts are anticipated affecting PRoW during the operational phase. The likely human health and wellbeing effect arising from connections between local communities during the operational phase is therefore assessed to be **neutral**. <u>During decommissioning of the hydrogen production facility</u> As set out in **Chapter 23: Socio-economics**, it is assessed in a worst case scenario that temporary closure of Public Bridleway 36 for the duration of the decommissioning phase may take place, and therefore there will be a significant effect on severance of communities via disruption to users of PRoW. This preliminary assessment is to be refined at ES stage. The human health and wellbeing impact on community connectivity is therefore assessed to be **negative**.		

Table 24.16: Climate Change

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
Does the proposal incorporate renewable energy?	Yes (during construction and operation)	**Chapter 19: Climate Change** of this PEI report sets out an assessment of the likely impact of direct and indirect greenhouse gas (GHG) emissions arising from the Project on the climate, including how it would affect the ability of the UK to meet its carbon reduction targets. During construction **Chapter 19: Climate Change** sets out the construction phase of the Project is likely to have an adverse impact with respect to GHG emissions, the majority of which will arise from embodied carbon in construction materials. However, given the role the Project will eventually play in reducing the UK's carbon footprint, in context the emissions generated in the construction phase are assessed to be of Minor Adverse significance. The human health and wellbeing impact arising from the likely GHG emissions during the construction phase is likely to be **negative**. During operation One of the key drivers for the Project is to assist the UK in meeting its net zero targets through the handling and production of green hydrogen to help decarbonise the transportation sector and to help facilitate the use of carbon capture and storage. The purpose of the jetty (the NSIP) is to facilitate the import and export of liquid bulk materials which support the green energy and carbon capture sectors. The hydrogen production facility (associated development) will enable green hydrogen to be produced from imported ammonia to support the transition to net	**-** during construction **-** during operation **n/a** during decommissioning	During construction n/a During operation Implementation of appropriate mitigation measures to reduce GHG emissions associated with the operational phase of the Project During decommissioning of the hydrogen production facility n/a

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
		zero, by providing a zero carbon fuel for the transport sector. The ammonia will be produced using renewable energy sources. GHG emissions during the operational phase of the Project will be associated with utilities and transport, the majority of which will be associated with shipping emissions (although in the future, a gradual switch in the shipping fleet to the use of decarbonised fuel is expected). The following mitigation measures to avoid or minimise operational emissions are being considered and will be developed further and included in the ES: future transition of Very Large Gas Container (VLGC) fleet to sustainable low carbon fuels over time (over the long term, a similar transition can be expected across the wider marine fleet, to include similar vessels in the carbon capture sector); energy and heat/ cold integration measures including potential reuse of process tail gas as fuel; use of best available techniques for energy management as part of the Environmental permit; use of energy efficient lighting; future use of biogas and or hydrogen to replace natural gas fuel; and, use of Advanced fleet scheduling and supply chain optimisation for distribution will reduce the impact of vehicle movements. The preliminary assessment concludes these emissions are assessed to be Minor Adverse. These emissions should be in the context of the potential national emissions reductions the Project will facilitate through decarbonisation of UK transport. Based on above, the preliminary assessment of the human health and wellbeing impact arising from the likely GHG emissions during the operational phase is likely to be **negative**. During decommissioning of the hydrogen production facility		

Assessment Criteria	Relevant to the Project?	Details and Evidence	Potential Health Impact	Further Action or Mitigation Recommended
		n/a – an assessment of GHG emissions during the decommissioning of the Project is scoped out of this PEI Report, as set out in **Chapter 19: Climate Change.**		

24.7 Summary of Preliminary Assessment

24.7.1 This assessment has followed guidance set out by the HUDU Rapid Health Impact Assessment Toolkit' and has regard to WHIASU guidance in order to assess the potential effects on human health and wellbeing arising from the Project. The assessment has considered health impacts arising from determinants of health including:

a. **Access to healthcare services and other social infrastructure** – it is unlikely that there will be any severance between local residents and healthcare facilities or other social infrastructure during the construction, operation or decommissioning phases of the Project. This is because no severance effects are anticipated arising from traffic or transport. There may be some additional demand on healthcare services and other social infrastructure during the construction, operation and decommissioning phases, should workers move to the area to work on the Project. **Chapter 23: Socio-economics** sets out this effect is anticipated to be negligible during the construction and decommissioning phases and an adverse (not significant) effect during the operational phase.

   i. During construction, the likely impact on human health and wellbeing regarding access to healthcare services and other social infrastructure is assessed as: neutral.

   ii. During operation, the impact on human health and wellbeing regarding access to healthcare services and other social infrastructure is assessed as: negative.

   iii. During decommissioning, the impact on human health and wellbeing regarding access to healthcare services and other social infrastructure is assessed as: neutral.

b. **Air quality, noise and neighbourhood amenity** – suggested mitigation measures include implementation of a CEMP, DMP, CLP, Odour Management Plan, operational noise control scheme and Travel Plan. Following implementation of mitigation measures, it is assessed that air quality impacts during construction, operation and decommissioning of the Project will be negligible. It is assessed that following implementation of impact avoidance measures, noise impacts during the construction, operation and decommissioning of the Project on homes on Queens Road would be up to major adverse, which is considered a significant noise effect.

   i. During construction, the impact on human health and wellbeing in relation to air quality, noise and neighbourhood amenity is assessed as: negative.

   ii. During operation, the impact on human health and wellbeing in relation to air quality, noise and neighbourhood amenity is assessed as: negative.

   iii. During decommissioning, the impact on human health and wellbeing in relation to air quality, noise and neighbourhood amenity is assessed as: negative.

c. **Accessibility and active travel** – in all phases of the Project, it is assessed that there will be no significant impact on pedestrian safety, fear or intimidation, and as such no resulting human health and wellbeing impact as a result of these considerations. However, as a result of the preliminary assessment that temporary closure of PRoW for the duration of construction and decommissioning phases will be required, and therein a major adverse socio-economics effect would result, there is likely to be a negative human health and wellbeing impact on accessibility and active travel.

   i. During construction, the impact on human health and wellbeing in relation to accessibility and active travel is assessed as: negative.

   ii. During operation, the impact on human health and wellbeing in relation to accessibility and active travel is assessed as: neutral.

   iii. During decommissioning, the impact on human health and wellbeing in relation to accessibility and active travel is assessed as: negative.

d. **Access to work and training** – the construction of the Project is expected to generate construction-related employment on Site, and within the supply chain and local economy. Additionally, the operation and decommissioning of the Project would also be expected to generate employment. There will be some loss of employment on Site due to the displacement of existing businesses within the Site boundary. Overall there is expected to be a net increase in employment opportunities locally arising from the Project.

   i. During construction, the impact on human health and wellbeing in relation to access to work and training is assessed as: positive.

   ii. During operation, the impact on human health and wellbeing in relation to access to work and training is assessed as: positive.

   iii. During decommissioning, the impact on human health and wellbeing in relation to access to work and training is assessed as: positive.

e. **Social cohesion and lifetime neighbourhoods –** perception of risk will be managed through the adoption of best practice community engagement measures, however given the subjective nature of perception and mental health, it is possible that negative impacts could arise in a worst-case scenario. With regard to community severance, no health and wellbeing impact is likely during the operation phase of the Project, however due to the preliminary assessment that temporary closure of PRoW for the duration of the construction and decommissioning periods will be required in a worst case scenario and a major adverse socio-economics effect would result, there is likely to be a negative human health and wellbeing impact.

   i. During construction, with regard to perception of risk, the potential impact on human health and wellbeing is assessed as: negative.

   ii. During construction, with regard to community severance, the impact on human health and wellbeing is assessed as: negative.

   iii. During operation, with regard to perception of risk the potential impact on human health and wellbeing is assessed as: negative.

iv. During operation, with regard to community severance, the impact on human health and wellbeing is assessed as: neutral.

v. During decommissioning, the potential impact with regard to perception of risk on human health and wellbeing is assessed as: negative.

vi. During decommissioning, with regard to community severance, the impact on human health and wellbeing is assessed as: negative.

f. **Climate change** – **Chapter 19: Climate Change** sets out the construction phase of the Project is likely to generate GHG emissions, the majority of which will arise from embodied carbon in construction materials. The Project is also likely to generate GHG emissions during the operational phase, the majority of which will be associated with shipping emissions. A key driver for the Project is to assist the UK in meeting its net zero targets. It will achieve this through the handling and production of green hydrogen to help decarbonise the transportation sector and to help facilitate the use of carbon capture and storage. However, the direct impact of the emissions generated by the Project would be expected to have a negative impact on health.

i. During construction, the impact on human health and wellbeing with regard to climate change is assessed as: negative.

ii. During operation, the impact on human health and wellbeing with regard to climate change is assessed as: negative.

24.8 References

Ref 24-1 Institute of Environmental Management and Assessment (IEMA), (2022); Guide to: Determining Significance for Human Health in Environmental Impact Assessment.

Ref 24-2 NHS London Healthy Urban Development Unit (HUDU) (2019); HUDU Planning for Health: Rapid Health Impact Assessment Tool.

Ref 24-3 Wales Health Impact Assessment Support Unit (WHIASU), (2020); Health Impact Assessment (HIA): A Practical Guide.

Ref 24-4 Department for Transport, (2012); National Policy Statement for Ports.

Ref 24-5 Ministry of Housing, Communities and Local Government (2021); National Planning Policy Framework.

Ref 24-6 NHS, (2019); The NHS Long Term Plan.

Ref 24-7 HM Government, (2022); Health and Care Act 2022 (c.31).

Ref 24-8 Department of Health, (2012); Health and Social Care Act (c.7).

Ref 24-9 HM Government, (2022); Levelling Up the United Kingdom.

Ref 24-10 Planning Practice Guidance (2019); Guidance on promoting healthy and safe communities.

Ref 24-11 Public Health England, (2019); PHE Strategy 2020 to 2025.

Ref 24-12 HM Government, (2018); A Green Future: Our 25 Year Plan to Improve the Environment.

Ref 24-13 Institute of Health Equity, (2020); Health Equity in England: The Marmot Review 10 Years On.

Ref 24-14 Institute of Health Equity, (2020); Build Back Fairer: The COVID-19 Marmot Review. The Pandemic, Socioeconomic and Health Inequalities in England.

Ref 24-15 Institute of Health Equity, (2010); Fair Society, Healthy Lives, The Marmot Review.

Ref 24-16 Lincolnshire County Council (2018); Joint Health and Wellbeing Strategy and Lincolnshire.

Ref 24-17 North East Lincolnshire Council, (2018); Local Plan 2013 to 2032.

Ref 24-18 North Lincolnshire Council, (2011); North Lincolnshire Local Development Framework Core Strategy.

Ref 24-19 Central Lincolnshire Joint Strategic Planning Committee (2019); Central Lincolnshire Local Plan.

Ref 24-20 ONS, (2020); Mid-Year Population Estimates.

Ref 24-21 Office for National Statistics (2011); 2011 Census.

Ref 24-22 Ministry of Housing, Communities and Local Government (2019); English indices of deprivation 2019.

Ref 24-23 Office for Health Improvements and Disparities, (2022); Local Authority Health Profiles.

Ref 24-24 Office for Health Improvements and Disparities, (2022); Modelled Prevalence Estimates.

Ref 24-25 NHS Digital, (2022); Patients Registered at a GP Practice – August 2022.

Ref 24-26 NHS Digital, (2022); General Practice Workforce.

Ref 24-27 Royal College of General Practitioners, (2005); Information Paper. Royal College of General Practitioners.

24.9 Abbreviations and Glossary of Terms

Table 24.17: Glossary and Abbreviations

Term	Acronym	Meaning
Healthy Urban Development Unit	HUDU	Organisation working on behalf of the NHS to provide specialist expertise and planning guidance in order to improve health and wellbeing
Health Impact Assessment	HIA	Process to estimate the health impacts of a development intervention on a population
Wales Health Impact Assessment Support Unit	WHIASU	Organisation which provide specialist expertise and planning guidance on conducting health impact assessments
National Planning Policy Framework	NPPF	Overarching document outlining the government's planning policies
National Policy Statement	NPS	Overarching policy statements produced by government
Electromagnetic Field(s)	EMF	Radiation associated with electrical power infrastructure
Air Pollution Information Service	APIS	Body which publishes publicly available maps of background pollutant data across the UK
Institute of Air Quality Management	IAQM	The professional body for air quality practitioners
Health and Safety Executive	HSE	UK Health and Safety Regulator and statutory consultee
Environment Agency	EA	Non-departmental public body, established in 1996 and sponsored by the United Kingdom government's Department for Environment, Food and Rural Affairs, with responsibilities relating to the protection and enhancement of the environment in England.
Lower Super Output Area	LSOA	Small geographical units with broadly similar populations used for the reporting of statistics to allow comparison between areas at a granular scale.
Office for Health Improvement and Disparities	OHID	Successor to Public Health England focusing on health priorities, a part of Department for Health and Social Care
Coronary Heart Disease	CHD	A health condition affecting the heart
Chronic Obstructive Pulmonary Disease	COPD	A health condition affecting the pulmonary system

Term	Acronym	Meaning
Tuberculosis	TB	A contagious infection affecting the lungs, and other organs
General Practitioner	GP	A medical professional who provides primary care
Integrated Care Board	ICB	Established statutory bodies responsible for the delivery of healthcare within an area
Construction Traffic Management Plan	CTMP	Sets out mitigation measures relating to construction traffic associated with a Project
Dust Management Plan	DMP	A Dust Management Plan manages dust emissions generated within the project area, so that the appropriate dust criteria is met during both the construction and operational stages of the Project
Noise Sensitive Receptors	NSR	Receptors which are potentially sensitive to noise. These comprise mainly residential buildings, but also include educational buildings, hospitals and places of worship
As Low As Reasonably Possible	ALARP	Condition of being as low as reasonably possible
Greenhouse Gas	GHG	Term used by UK Regulatory Authorities and throughout industry to denote that risk is reduced to a level which is a low as practically achievable with existing technology.

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume II – Main Report

Chapter 25: Cumulative Effects and In-Combination Assessment

Associated British Ports

Document History

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Table of contents

Chapter **Pages**

Tables

Plates

25 Cumulative Effects and In-Combination Assessment

25.1 Introduction

25.1.1 This chapter of the Preliminary Environmental Information (PEI) Report presents a preliminary assessment of the potential for cumulative and in-combination effects as a result of the Project.

25.1.2 The cumulative effects assessment (CEA) considers the following types of effect:

a. **In-combination (combined) effects**: these effects occur where a single receptor is affected by more than one source of effect from different aspects of the Project. An example of an in-combination effect could be where a local resident is affected by dust, noise and traffic disruption during the construction of the Project, with the result being a greater nuisance than each individual effect alone.

b. **Cumulative effects**: these effects occur as a result of a number of developments, which individually might not be significant, but when considered together with the Project could create a significant cumulative effect on a shared receptor.

25.1.3 The Environmental Statement (ES) that will accompany the application for development consent will include an assessment of potential cumulative and in-combination effects taking into account applicable legislation and guidance as detailed in **Section 25.2** using the methodology as detailed in **Section 25.4**.

25.1.4 This chapter provides a preliminary assessment of the potential for in-combination effects due to the Project. This chapter also provides details of other proposed developments within the vicinity of the Project that may be of relevance to the CEA, using information that is in the public domain. This includes information on Nationally Significant Infrastructure Projects (NSIPs), North East Lincolnshire Council (NELC) Local Plan allocations, proposed schemes that have planning applications registered with the local planning authorities and/or already consented developments that have not yet been constructed or are operational.

25.1.5 The CEA does not consider developments that are already constructed and operating, as such existing operational facilities are accounted for in the baseline conditions established for the assessments as reported within **Chapters 6** to **24** of this PEI Report.

25.1.6 This chapter is supported by **Figure 25.1** (PEI Report, Volume III) which illustrates the Project location in relation to other developments currently scoped into the CEA.

25.2 Legislation, Planning Policy and Guidance

25.2.1 Due to the potential for cumulative and in-combination effects to occur as a result of the construction, operation and maintenance and eventual decommissioning of the Project, a cumulative assessment will be undertaken and reported in the ES in accordance with the Infrastructure Planning (Environmental Impact

Assessment) Regulations 2017 (EIA Regulations) (Ref 25-1) and the assessment requirements of the National Policy Statement for Ports (NPSfP) (Ref 25-2).

25.2.2 The requirement for cumulative and in-combination impact assessments is stated in relevant legislation as detailed below.

25.2.3 Schedule 4 paragraph 5 of the EIA Regulations (Ref 25-1) requires:

25.2.4 'A description of the likely significant effects of the development on the environment resulting from, inter alia […] (e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources'. The EIA Regulations state that this description of likely significant effects '*should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development*'.

25.2.5 Consideration is also given to relevant National Policy Statements (NPS) and Marine Policy Statements (MPS) with regard to the need for cumulative assessment.

25.2.6 Paragraph 4.7.1 of the NPSfP (Ref 25-2) states that:

'The Directive requires a description of the likely significant effects of the proposed project on the environment, covering the direct effects and any indirect, secondary, cumulative, short-, medium- and long-term, permanent and temporary, positive and negative effects of the project, and also of the measures envisaged for avoiding or mitigating significant adverse effects. When considering a proposal, the decision maker should ensure that likely significant effects at all stages of the project have been adequately assessed and should request further information where necessary.'

25.2.7 Paragraph 4.7.3 of the NPSfP (Ref 25-2) goes on to state that when considering cumulative effects:

25.2.8 '*The ES should provide information on how the effects of the applicant's proposal would combine and interact with the effects of other development (including projects for which consent has been sought or granted, as well as those already in existence). The decision-maker may also have other evidence before it, for example from appraisals of sustainability of relevant NPSs or development plans, on such effects and potential interactions. Any such information may assist the decision-maker in reaching decisions on proposals and on mitigation measures that may be required.'*

25.2.9 Paragraph 2.4.3 of the MPS (Ref 25-5) states that:

'The marine plan authority will need to consider the potential cumulative impact of activities and, using best available techniques, whether for example:

a. The cumulative impact of activities, either by themselves over time or in conjunction with others, outweigh the benefits;

b. A series of low impact activities would have a significant cumulative impact which outweighs the benefit;

c. An activity may preclude the use of the same area/resource for another potentially beneficial activity.'

25.2.10 Policy ECO1 of the East Inshore and East Offshore Marine Plan (Ref 25-6) states:

'Cumulative impacts affecting the ecosystem of the East marine plans and adjacent areas (marine, terrestrial) should be addressed in decision-making and plan implementation.'

25.3 Consultation

25.3.1 A summary of relevant consultation of relevance to the CEA undertaken to date is provided in **Table 25.1**.

Table 25.1 Summary of Consultation

Consultee	Method of Consultation	Summary	Addressed in PEI Report
Planning Inspectorate	Scoping Opinion (**Appendix 1.B** of PEI Report Volume IV)	The Scoping Report (**Appendix 1.A** of PEI Report Volume IV) states that the significance of intra-project effects would be determined using professional judgement, and no further details are provided on the methodology. The ES should explain how potential interactions are identified and provide justification for the conclusions reached.	**Section 25.4** and **Section 25.5** explains the methodology and approach to the in-combination effects assessment.
		The Scoping Report does not suggest any other developments for inclusion on the longlist. The Applicant is advised to agree the list of developments with NELC, where possible. The ES should include a summary table, with relevant developments' current stage, location and timing of the proposed works to help to identify potential overlaps between activities that could lead to cumulative impacts.	The Applicant is currently engaging with NELC on the long list for the Project. The CEA included in the ES will include any developments NELC suggest should be considered. The Applicant has provided NELC with a long list for the CEA and we are awaiting a response.
		The ES should include a figure depicting the locations and extent of cumulative developments in relation to the Proposed Development.	**Figure 25.1** (PEI Report, Volume III) supports this chapter and shows the location of the shortlisted developments for the CEA in relation to the Site.

Consultee	Method of Consultation	Summary	Addressed in PEI Report
North East Lincolnshire Council (NELC)	Email	In accordance with the Planning Inspectorate's Scoping Opinion, it was advised the Applicant should agree the list of developments to be included on the long list with the NELC.	The Applicant has provided NELC with a long list for the CEA and a response is awaited.

25.4 Assessment Methodology

25.4.1 There is no standard method for assessing cumulative and in-combination effects. A conjunction of professional judgement and established guidance has been used to define an appropriate scope for the CEA. The Inspectorate's Advice Note Seventeen (Ref 25-4) has been used to inform the scope of the CEA and to assist with the identification of relevant developments.

Assessment of In-combination Effects

25.4.2 The assessment of in-combination effects has considered whether a single environmental receptor or resource would likely be affected by more than one source of effect from different aspects of the Project. The assessment methodology involves the identification of impact interactions associated with the Project upon separate environmental receptors and resources, in order to understand the overall environmental effect of the Project.

25.4.3 Potential interactions have been identified by reviewing the conclusions within the technical chapters in this PEI Report (**Chapters 6 – 24**) in order to establish where individual impacts may combine and result in likely significant in-combination effects.

25.4.4 The significance of in-combination effects upon the environmental receptors and resources will be determined in the ES using professional judgement, with input provided from those responsible for the production of the individual topic assessments (**Chapters 6 – 24**). At this preliminary assessment stage, given that the full assessments have not yet been completed, this chapter aims to indicate whether there is the potential for in-combination effects, but does not assign levels of significance. The significance of potential in-combination effects will be reported in full within the ES.

Assessment of Cumulative Effects

25.4.5 In accordance with the approach contained within the Inspectorate's Advice Note Seventeen (Ref 25-4), the approach to the CEA follows a staged approach, as summarised in **Plate 25-1**.

25.4.6 For the purposes of the PEI Report, Stages 1 and 2 have been completed and are reported in **Section 25.6**. Stages 3 and 4 will be completed and reported within the ES. During ES preparation the occurrence of new developments in the vicinity of the Project of relevance to the CEA will be reviewed.

Plate 25-1 Staged Approach to the Cumulative Assessment

Stage 1: Establishing the long list of 'other existing development and/or approved development'

25.4.7 Stage 1 has involved establishing the Project's Zone of Influence (ZoI) associated with the topic areas assessed within which a long list of other planned developments and development allocations.

25.4.8 Developments have been included on the current long list based on the criteria presented in **Table 25.2** and assigned a subsequent tier in accordance with the Inspectorate's Advice Note Seventeen (Ref 25-4). **Table 25.2** provides criteria used to indicate the certainty that can be applied to each development from Tier 1 (most certain) to Tier 3 (least certain).

Table 25.2 Development Tier in Accordance with Advice Note Seventeen

Tier	Degree of Certainty
Tier 1	• Development currently under construction. • Approved applications which have not yet been implemented (covering the past five years and taking account of those that received planning consent over three years ago and are still valid but have not yet been completed). • Submitted applications not yet determined. • Refused applications, subject to appeal procedures not yet determined.
Tier 2	• Developments on the National Infrastructure Planning Programme of Projects (if a Scoping Report has been submitted).

Tier	Degree of Certainty
Tier 3	• Developments on the National Infrastructure Planning Programme of Projects (if a Scoping Report has not been submitted). • Development identified in the relevant Development Plan (and emerging Development Plans). • Development identified in other plans and programmes which set the framework for future development consents/approvals, where such development is reasonably likely to come forward.

25.4.9 For planning applications that have submitted a variation application both the original application and the variation have been considered.

25.4.10 Consultation with NELC has also commenced to establish the current long list.

Stage 2: Establishing a shortlist of 'other existing development and/or approved development'

25.4.11 At Stage 2, any development of a nature or scale without the potential to result in cumulative impacts has been excluded with due consideration given to the likely ZoI for each environmental topic.

25.4.12 The criteria used to determine whether to include or exclude other existing development and/or approved development from the shortlist, based on the guidance provided in the Planning Inspectorate's Advice Note Seventeen (Ref 25-4), is detailed below:

- **Temporal scope:** Considering the relative construction, operation or decommissioning programmes of the 'other existing development and/or approved development' identified as part of Stage 1 and establishing whether there is an overlap or any potential for interaction with the Project.
- **Scale and nature of development:** Considering whether the scale and nature of the 'other existing development and/ or approved development' identified at Stage 1 are likely to interact with the Project.
- **Source-pathway-receptor linkages:** Considering any other factors such as the nature and/or capacity of the receiving environment that would make a significant cumulative effect as a result of the Project and developments identified in Stage 1 more or less likely utilising a source-pathway-receptor approach.

Stage 3: Information Gathering

25.4.13 Stage 3 involves reviewing the available information relating to shortlisted developments in order to establish the details of their likely environmental effects.

25.4.14 Information relating to the shortlisted developments will be collected from the appropriate sources which may include the local planning authority websites, the Inspectorate's website or directly from the applicant/developers, and will include, but not be limited to:

a. Proposed design and location information.

b. Proposed programme of demolition, construction, operation and/or decommissioning.

c. Environmental assessments that set out baseline data and effects arising from 'other development'.

Stage 4: Assessment

25.4.15 Those developments which are shortlisted in Stage 2 and have available information gathered at Stage 3 will be incorporated into the final CEA to be reported in the ES. This will involve identifying where cumulative effects are likely to occur and assessing the significance of those effects on environmental receptors and resources, taking into account any defined mitigation measures.

25.4.16 The criteria for determining the significance of any potential cumulative effect will be based upon:

a. The duration of effect i.e. would be temporary or permanent.

b. The extent of effect i.e. the geographical area of an effect.

c. The type of effect i.e. whether additive or synergistic.

d. The frequency of the effect.

e. The 'value' and resilience of the receptor affected.

f. The likely success of mitigation on the Project and the developments included within the CEA.

25.4.17 The assessment will be documented in a matrix in accordance with Matrix 2 in Appendix 2 of the Inspectorate's Advice Note Seventeen (Ref 25-4).

25.5 In-Combination Effects

25.5.1 An assessment of the potential for in-combination effects has been undertaken as part of this preliminary assessment which considers each environmental topic presented within this PEI Report (**Chapters 6 – 24**) and potential impacts upon a 'Shared Receptor List'.

25.5.2 A summary of the potential shared receptors that may be affected by the Project is presented in **Table 25.3**. Receptors that could be impacted by the Project as detailed in the technical chapters presented within this PEI Report are indicated in the table by an 'X'. Information presented in **Table 25.3** has been compiled with input from those responsible for the production of the individual topic assessments. The table illustrates how individual receptor types could be impacted by the potential effects outlined within the technical chapters of the PEI Report. For example, residential receptors could potentially be impacted by air quality, noise and vibration, traffic and transport, landscape and visual, major accident and disaster, socio-economics and human health and wellbeing effects. Any combination of these effects could potentially lead to an in-combination effect.

Table 25.3 Shared Receptor List and Associated Project Impacts

Receptor	Technical Chapters																	
	Air Quality	Noise and Vibration	Terrestrial Ecology	Marine Ecology	Ornithology	Traffic and Transport	Marine Transport and Navigation	Landscape and Visual Impact	Historic Environment (Terrestrial)	Historic Environment (Marine)	Physical Processes	Marine Water and Sediment Quality	Water Quality, Coastal Protection, Flood Risk and Drainage	Climate Change	Materials and Waste	Ground Conditions and Land Quality	Major Accidents and Disasters	Socio-Economics	Human Health and Wellbeing
Residential Receptors	X	X				X		X									X	X	X
Human Health	X	X				X		X								X	X		X
Communities and local population	X	X				X	X	X									X	X	X
Public Rights of Way/Cycle Routes/Roads and Railways	X	X				X		X									X	X	
Historic Buildings/Features and Archaeological Sites									X	X							X		

Receptor	Technical Chapters																	
	Air Quality	Noise and Vibration	Terrestrial Ecology	Marine Ecology	Ornithology	Traffic and Transport	Marine Transport and Navigation	Landscape and Visual Impact	Historic Environment (Terrestrial)	Historic Environment (Marine)	Physical Processes	Marine Water and Sediment Quality	Water Quality, Coastal Protection, Flood Risk and Drainage	Climate Change	Materials and Waste	Ground Conditions and Land Quality	Major Accidents and Disasters	Socio-Economics	Human Health and Wellbeing
Watercourses											X	X	X				X		
Water and Sediment Quality												X	X				X		
Benthic Habitats and Species				X								X					X		
Fish				X													X		
Marine Mammals				X													X		
Coastal Waterbirds	X				X												X		
Breeding Birds	X				X												X		
Bats, Otters, Voles			X														X		
Woodland and Designated Sites	X		X	X	X			X									X		

Receptor	Technical Chapters																	
	Air Quality	Noise and Vibration	Terrestrial Ecology	Marine Ecology	Ornithology	Traffic and Transport	Marine Transport and Navigation	Landscape and Visual Impact	Historic Environment (Terrestrial)	Historic Environment (Marine)	Physical Processes	Marine Water and Sediment Quality	Water Quality, Coastal Protection, Flood Risk and Drainage	Climate Change	Materials and Waste	Ground Conditions and Land Quality	Major Accidents and Disasters	Socio-Economics	Human Health and Wellbeing
Flood Defences and Flood Risk Receptors													X						
Geology																X			
Hydrogeology																X			
Soils/Groundwater																X			
Existing Development	X	X				X	X	X								X	X	X	
Existing Business	X	X				X	X	X								X	X	X	X
Proposed Development												X	X	X		X	X		
Power/Gas Supplies																	X		

Receptor	Technical Chapters																	
	Air Quality	Noise and Vibration	Terrestrial Ecology	Marine Ecology	Ornithology	Traffic and Transport	Marine Transport and Navigation	Landscape and Visual Impact	Historic Environment (Terrestrial)	Historic Environment (Marine)	Physical Processes	Marine Water and Sediment Quality	Water Quality, Coastal Protection, Flood Risk and Drainage	Climate Change	Materials and Waste	Ground Conditions and Land Quality	Major Accidents and Disasters	Socio-Economics	Human Health and Wellbeing
Global Climate														X					
Landfill, Safeguarded/ Allocated Mineral and Waste Sites															X				

25.5.3 **Table 25.3** indicates that some receptors are shared across technical disciplines. For example, residential receptors in the vicinity of the Project have the potential to be impacted by air quality, noise and vibration, traffic and transport, visual, major accidents and disasters (MA&D), socio-economics and health and wellbeing effects, as associated with the Project. This illustrates that for some shared receptors, there is the potential for in-combination effects that need to be investigated further as part of the ES.

25.5.4 The potential for in-combination effects upon shared receptors will be reported in the ES across all stages of the Project. An overall assessment of each potential in-combination effect will be presented, with each being defined as either significant or not significant.

25.6 Cumulative Effects Assessment (Stages 1 and 2)

25.6.1 Cumulative effects are generally unlikely to arise unless other development sites are in close proximity to the Project. However, the nature of potential effect and the actual distance at which two developments cumulatively impact a receptor depends on the nature of the impact (e.g. cumulative air quality effects could occur for the Project at a greater distance than say noise and vibration effects).

25.6.2 The study area for the consideration of cumulative effects has been developed by taking into account the predicted ZoI for each technical discipline as reported in this PEI Report (**Chapters 6** to **24**).

25.6.3 The largest ZoI within the PEI Report technical assessments is 10km for the assessment of air quality effects on nature conservation receptors. As a result, the maximum ZoI used for the cumulative assessment is 15km as a precautionary approach at this PEI stage. The areas of search within this maximum ZoI were then varied depending upon the type and scale of development as follows:

a. 15km – Nationally Significant Infrastructure Projects (NSIPs) (based on potential air quality and visual effects in accordance with standard guidance).

b. 5km – Major developments (as defined in section 2 of The Town and Country Planning (Development Management Procedure) (England) Order 2015) (Ref 25-7).

c. 5km – Marine licence activities/development.

d. 5km – Local plan allocations (adopted and emerging).

e. 1km – Non-major development (other development which does not meet the criteria for major development (excludes very small scale development such as domestic extensions or garages, for which cumulative effects are unlikely to arise when considered alongside another development).

25.6.4 An initial screening exercise was undertaken (Stage 1) to identify the various tiered developments within the study area as detailed above to create an initial long list for consideration based on Appendix 1 Matrix 1 of the Inspectorate's Advice Note Seventeen (Ref 25-4). This initial long list has subsequently been screened based on the potential for interactions with the Project across all the technical disciplines considered within this PEI Report (**Chapters 6 - 24**). The

result of this screening exercise, and those developments that have been progressed to Stage 2, as well as the justification for shortlisting developments from the long list, is provided in **Table 25.4**Table 25.4.

25.6.5 This shortlist of developments will subsequently be taken through Stages 3 and 4 of the CEA process as detailed in **Section 25.4** and reported in the ES in accordance with Appendix 2 Matrix 2 of the Planning Inspectorate's Advice Note Seventeen (Ref 25-4).

Table 25.4 Stage 2 Screening for Detailed CEA (Shortlist)

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
1	DM/1145/19/FUL (includes variation of conditions application DM/0603/22/FUL) Construction and operation of an energy park comprising photovoltaic (PV) solar panels together with battery storage	Major	517m south of the Site	Yes – Construction period has the potential to overlap with the Project	Yes – Potential for significant environmental effects that merit consideration within the CEA	Yes
3	DM/0105/18/FUL (includes variation of conditions application DM/0545/20/NMA) Hybrid application seeking outline consent with access, landscaping and scale to be considered for the development of a 62ha Business Park comprising up to 120,176 m^2	Major	938m south of the Site	Yes – Construction periods have the potential to overlap if both Projects proceed	Yes – Potential for significant environmental effects that merit consideration within the CEA	Yes
5	DM/0968/19/FUL Variation of conditions 1 (Approved Plans) and 2 (Scheme of Landscaping) as granted in permission DC/101/98/IMM	Major	Immediately south of the Site	Yes – Potential for construction periods to overlap	Yes – Potential for significant environmental effects that merit consideration within the CEA	Yes

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
6	DM/0120/21/FUL Erect 80MW battery energy storage site with associated external works	Minor	653m south of the Site	Yes – Construction periods have the potential to overlap if both Projects proceed	No – Due to the scale and nature of the proposed development	No

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
7	DM/0111/19/SCR Screening request for the siting of 10 x 2MW flexible gas generation plant (total of 20MW)	Major	507m south of the Site	Potentially	Unknown – The Screening Opinion has stated this is EIA development however a full application has not been progressed at this stage and limited information exists on the proposed development The timing of the delivery for this development means that the applicant will, in due course, need to consider the cumulative effects with the Project, but the reverse is not required	No
8	DM/0762/21/FUL Erect 80 MW battery energy facility and associated external works	Major	507m south of the Site	Yes – Potential for construction periods to overlap	No – Due to the scale and nature of the proposed development	No

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
9	DM/0865/19/FUL Erection of 20MW gas fuelled embedded energy generation compound – Site 4	Major	507m south of the Site	Yes – Potential for construction periods to overlap	Yes – Potential for significant environmental effects that merit consideration within the CEA	Yes
10	DM/0864/19/FUL Erection of 20MW gas fuelled embedded energy generation compound - Site 3	Major	507m south of the Site	Yes – Potential for construction periods to overlap	Yes – Potential for significant environmental effects that merit consideration within the CEA	Yes
11	DM/1016/17/FUL Erection of a Small-Scale Electricity Battery Storage Plant	Major	507m south of the Site	Yes – Potential for construction periods to overlap	No – Due to the scale and nature of the proposed development	No
12	DM/1111/19/FUL Erect new electrical substation, control room and electrical gear, erection of 2.44m high steel fence	Minor	507m south of the Site	Yes – Potential for construction periods to overlap	No – Due to the scale and nature of the proposed development	No

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
13	DM/0628/18/FUL (includes variation of conditions DM/0274/20/FUL) Partially demolish existing building and erect 20MWE waste to energy power generation facility, 65m stack and associated plant, machinery	Minor	507m south of the Site	Yes – Potential for construction periods to overlap	Yes – Potential for significant environmental effects that merit consideration within the CEA	Yes
14	DM/0110/19/SCR Screening request for the siting of 10 x 2MW flexible gas generation plant (total of 20MW)	Minor	507m south of the Site	Unknown - The proposed development application has not been progressed at this stage	Unknown – The Screening Opinion has stated this is EIA development however a full application has not been progressed at this stage and limited information exists on the proposed development	No – this scheme will need to consider cumulative effects with this Project
15	DM/1056/20/FUL Erection of 2no 24m (above ground level) Biomass Flues	Minor	507m south of the Site	Yes – Potential for construction periods to overlap	No – Due to the scale and nature of the proposed development	No

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
16	DM/0862/19/FUL Erection of 20MW gas fuelled embedded energy generation compound - Site 1	Major	417m south of the Site	Yes – Potential for construction periods to overlap	Yes – Potential for significant environmental effects that merit consideration within the CEA	Yes
17	DM/0863/19/FUL Erection of 20MW gas fuelled embedded energy generation compound - Site 2	Major	417m south of the Site	Yes – Potential for construction periods to overlap	Yes – Potential for significant environmental effects that merit consideration within the CEA	Yes
18	DM/0026/18/FUL Erect an Energy Recovery Facility with an electricity export capacity of up to 49.5MW and associated infrastructure including a stack to 90m high	Major	91m south of the Site	Yes – Potential for construction periods to overlap	Yes - Potential for significant environmental effects that merit consideration within the CEA	Yes
20	DM/0970/19/FUL Demolish existing 15m mast and erect 30.1m steel lattice mast to include installation of two satellite dishes	Major	51m north of the Site	Yes – Potential for construction periods to overlap	No – Due to the scale and nature of the proposed development	No

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
21	EN010107 South Humber Bank Energy Centre	NSIP	2.19km south of the Site	Yes – Potential for construction periods to overlap	Yes – Potential for significant environmental effects that merit consideration within the CEA	Yes
22	TR030007 Immingham Eastern Ro-Ro Terminal (IERRT)	NSIP	910m north of the Site	Yes – Potential for construction periods to overlap	Yes – Potential for significant environmental effects that merit consideration within the CEA	Yes
25	TR030001, TR030005 and TR030006 Able Marine Energy Park including Material Changes 1 and 2	NSIP	4.10km north of the Site	Yes – Potential for construction periods to overlap	Yes – Potential for significant environmental effects that merit consideration within the CEA	Yes

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
26	EN010097 VPI Immingham B OCGT	NSIP	3.73km north West of the Site	No – Construction commencing in 2023 and due to complete mid 2024	Yes - Potential for significant environmental effects that merit consideration within the CEA	Yes
27	EN010038 North Killingholme Power Project	NSIP	6.38km north West of the Site	Yes – Potential for construction periods to overlap	Yes - Potential for significant environmental effects that merit consideration within the CEA	Yes
28	EN070006 Humber Low Carbon Pipelines	NSIP	6.41km north West of the Site	Yes – Potential for construction periods to overlap	Yes – Potential for significant environmental effects that merit consideration within the CEA	Yes

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
29	EN070008 Viking CCS Pipeline	NSIP	2km south of the Site	Yes – Potential for construction periods to overlap	Yes - Potential for significant environmental effects that merit consideration within the CEA	Yes
30	DM/0899/21/FUL Install solar farm with associated works and infrastructure	Major	4.94km south of the Site	Yes – Potential for construction periods to overlap	No – Due to proximity from the Project	No
31	DM/0950/15/OUT (includes reserved matters DM/0211/20/REM) Outline application for a residential development of up to 118 dwellings	Major	4.68km west of the Site	Yes – Potential for construction periods to overlap	No – Due to proximity from the Project and scale and nature of the proposed development	No
32	DM/0622/20/MDO (this is a modification of planning application for DM/0950/15/OUT (ID 31 above)) Application to modify the planning obligation under Section 106 as granted on DM/0950/15/OUT	Major	4.68km west of the Site	Yes – Potential for construction periods to overlap	No – Due to proximity from the Project and scale and nature of the proposed development	No

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
33	PA/2022/1223 Hybrid application comprising full planning permission for the construction of a hardstanding area for external level storage, with landscaping, drainage, access	Major	2.7.0km north West of the Site	Yes – Potential for construction periods to overlap	No – Due to proximity from the Project and scale and nature of the proposed development	No
34	DM/0304/17/FUL Alterations to include new vehicular accesses, fencing and installation of lighting for the storage and distribution of vehicles associated with import/export activities at the Port of Grimsby.	Major	5.16km south of the Site	Yes – Potential for construction periods to overlap	No – Due to proximity from the Project and scale and nature of the proposed development	No
35	DM/0329/18/FUL Erection of industrial building and adjoined two storey office/control room to create power plant (18MW Energy From Waste)	Major	4.91km south of the Site	Yes – Potential for construction periods to overlap	Yes - Potential for significant environmental effects that merit consideration within the CEA	Yes
36	DM/0625/19/FUL Erection of industrial manufacturing building, installation of attenuation tank, erection of 2.4m high palisade fence/gates	Major	4.91km south of the Site	Yes – Potential for construction periods to overlap	No – Due to proximity from the Project and nature of the proposed development	No

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
37	DM/1070/18/FUL Construction of an energy from waste facility of up to 49.9MWe gross capacity including emissions stack(s) and associated infrastructure	Major	2.95km south of the Site	Yes – Potential for construction periods to overlap	Yes – Potential for significant environmental effects that merit consideration	Yes
39	DM/0848/14/FUL Development of a renewable power facility for the production of electricity using pre-treated fuel feedstocks	Major	619m south of the Site	No – Permitted in 2016	Yes – Potential for significant environmental effects that merit consideration	No
40	DM/0378/15/OUT (includes reserved matters DM/0198/20/REM and DM/1080/18/REM) Outline planning application with means of access to be considered for the construction of up to 250 residential dwellings	Major	3.49km south of the Site	Yes – Potential for construction periods to overlap	Yes – Potential for significant environmental effect that merit consideration	Yes
41	DM/0728/18/OUT Outline planning application for the development of up to 525 residential dwellings together with an extra care facility	Major	1.71km west of the Site	Yes – Potential for construction periods to overlap	Yes – Potential for significant environmental effect that merit consideration	Yes

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
42	DM/1175/17/FUL Residential development for 145 dwellings	Major	2.59km west of the Site	Yes – Potential for construction periods to overlap	Yes – Potential for significant environmental effect that merit consideration	Yes
57	HUMBER 3A Licensed disposal area	Marine Licence Application	2.08km north West of the Site marine boundary	n/a	No – Licensed disposal area not expected to interact with the Project during construction or operation	No
58	Holme Channel Deep Licensed disposal area	Marine Licence Application	2.39km north West of the Site marine boundary	n/a	No - Licensed disposal area not expected to interact with the Project during construction or operation	No
59	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR001 (Employment – Proposed Allocation)	Local Plan Allocation	Within the Site	No	Unlikely as no applications currently proposed within area	No

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
60	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR025a (Employment – Retained for long term business use)	Local Plan Allocation	Within the Site	No	Unlikely as no applications currently proposed within area	No
61	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR027 (Employment – Proposed Allocation)	Local Plan Allocation	Adjoining the Site	Yes	Yes - a planning application (DM/0026/18/FUL) has been submitted for this land. See ID 18 within this table.	No – covered by ID 18
62	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR003 (Employment – Proposed Allocation)	Local Plan Allocation	1.8km from the Site	No	Unlikely as no applications currently proposed within area	No
64	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR007 (Employment – Proposed Allocation)	Local Plan Allocation	951m from the Site	No	Unlikely as no applications currently proposed within area	No
65	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR008a-e (Employment – Proposed Allocation)	Local Plan Allocation	4.37km from the Site	No	Unlikely as no applications currently proposed within area	No

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
66	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR011 (Employment – Proposed Allocation)	Local Plan Allocation	3.46km from the Site	No	Unlikely as no applications currently proposed within area	No
67	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR015a-b (Employment – Proposed Allocation)	Local Plan Allocation	15a - 3.22km from the Site 15b - 3.8km from the Site	No	Unlikely as no applications currently proposed within area	No
68	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR016a-b (Employment – Proposed Allocation)	Local Plan Allocation	16a - 1.31km from the Site 16b - 0.81km from the Site	Yes	Yes - a planning application (DM/0105/18/FUL) has been submitted for this land. See ID 3 within this table.	No - covered by ID 3
69	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR019 (Employment – Proposed Allocation)	Local Plan Allocation	2.30km from the Site	No	Unlikely as no applications currently proposed within area	No
70	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR020 (Employment – Proposed Allocation)	Local Plan Allocation	2.52km from the Site	No	Unlikely as no applications currently proposed within area	No

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
71	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR021 (Employment - Retained for long term business use)	Local Plan Allocation	4.22km from the Site	No	Unlikely as no applications currently proposed within area	No
72	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR022 (Employment – Proposed Allocation)	Local Plan Allocation	712m from the Site	Yes	Yes - a planning application (DM/0848/14/FUL) has been submitted for this land. See ID 39 within this table.	No – covered by ID 39
74	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR025b (Employment - Retained for long term business use)	Local Plan Allocation	426m from the Site	No	Unlikely as no applications currently proposed within area	No
75	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR025c (Employment - Retained for long term business use)	Local Plan Allocation	1.27km from the Site	No	Unlikely as no applications currently proposed within area	No

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
76	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR025d (Employment - Retained for long term business use)	Local Plan Allocation	1.83km from the Site	No	Unlikely as no applications currently proposed within area	No
77	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR025e (Employment - Retained for long term business use)	Local Plan Allocation	897m from the Site	No	Unlikely as no applications currently proposed within area	No
78	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR037 (Employment – Proposed Allocation)	Local Plan Allocation	427m from the Site	No	Unlikely as no applications currently proposed within area	No
79	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR039a (Employment - Retained for long term business use)	Local Plan Allocation	1.12km from the Site	No	Unlikely as no applications currently proposed within area	No
80	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) ELR039b (Employment - Retained for long term business use)	Local Plan Allocation	1.68km from the Site	No	Unlikely as no applications currently proposed within area	No

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
81	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) HOU001 (Housing – Proposed Allocation)	Local Plan Allocation	633m from the Site	No	Unlikely as no applications currently proposed within area	No
82	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) HOU002 (Housing – Proposed Allocation)	Local Plan Allocation	2.55km from the Site	Yes	Yes - a planning application (DM/1175/17/FUL) has been submitted for this land. See ID 42 within this table.	No – covered by ID 42
83	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) HOU004 (Housing – Proposed Allocation)	Local Plan Allocation	2.50km from the Site	No	Unlikely as no applications currently proposed within area	No
84	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) HOU006 (Housing – Proposed Allocation)	Local Plan Allocation	1.67km from the Site	Yes	Yes - a planning application (DM/0728/18/OUT) has been submitted for this land. See ID 41 within this table.	No – covered by ID 41
85	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) HOU233 (Housing – Proposed Allocation)	Local Plan Allocation	2.06km from the Site	No	Unlikely as no applications currently proposed within area	No

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
86	Local Plan Allocation, North East Lincolnshire Council Local Plan (2018) HOU301 (Housing – Proposed Allocation)	Local Plan Allocation	464m from the Site	No	Unlikely as no applications currently proposed within area	No
87	DM/0422/17/FUL Construction of a carbon regeneration plant, hydrothermal plant and associated works.	Local Plan Allocation	1.85km north of the Site	Yes – Potential for construction periods to overlap	Yes – Potential for significant environmental effect that merit consideration	Yes
89	North Lincolnshire Council Housing Employment Land Allocations DPD (2016) SHBE-1: South Humber Bank, Employment Land Gross site area - 900 hectares. Indicative sector - Mixed (Note: the Examination Submission version of the North Lincolnshire Local Plan (November 2022) allocates the same site for employment use with reference "SS10: South Humber Bank". Example land use indicated as being B2, B8 Estuary Related including energy generation. Site area: 900 hectares.)	Local Plan Allocation	3.45km from the Site	No	Unlikely as no applications currently proposed within area	No

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
93	H1P-31, Land at School Road, South Killingholme Allocated for 21 dwellings including affordable Site area - 0.69 hectares.	Local Plan Allocation	4.7km from the Site	No	Unlikely as no applications currently proposed within area	No
94	Humber International Terminal berth 2: adaptation for car carriers Marine Management Organisation application: MLA/2020/00520	Marine Licence Application	2.63km from the Site	Yes	Yes – Potential for significant environmental effect that merit consideration	Yes
95	PA/2018/918 Planning permission to construct a new gas-fired power station with a gross electrical output of up to 49.9 megawatts. A further non-material amendment application has been made (PA/2021/1039)	Major	3.71km from the Site	Yes	Yes – Potential for significant environmental effect that merit consideration	Yes
96	DM/0111/21/FUL Installation of wash down facility to include new drainage, underground tanks, above ground tanks with 1 m high bunded wall enclosure, installation of 2.4 m high track and trace ANPR (automatic number plate recognition) system and siting of modular building for staff welfare at Immingham Lorry Park Pelham Road	Minor	0.89km from the Site	Yes	Yes – Potential for significant environmental effect that merit consideration	Yes

ID	Name/Description	Scale	Distance from the Site (approx.)	Stage 2 - Screening for detailed CEA		
				Overlap in temporal scope?	Scale and nature of development likely to have a significant effect?	Progress to Stage 3/4?
97	Environment Agency Humber Stallingborough Phase 3 Project	Major	1.8km from the Site	Yes	Yes – Potential for significant environmental effect that merit consideration	Yes

25.6.6 **Table 25.4** indicates that 22 of the 93 shortlisted developments should be considered further for their potential to generate significant adverse cumulative effects. Of these developments it is considered that the Immingham Eastern Ro-Ro Terminal (IERRT) (ID 22: TR030007) has the greatest potential to lead to significant cumulative effects in association with the Project due to its nature, scale and location - this development is discussed in the section below.

25.6.7 It should be noted the Applicant intends to submit a scoping report to NELC for a separate project in the near future. The project would comprise two onshore wind turbines constructed within the Port of Immingham. However, at this preliminary stage, few details are available and, as a result, this project has been scoped out of the CEA process to date. However, this will be revisited at the ES stage and assessed appropriately as more details become available.

Immingham Eastern Ro-Ro Terminal

25.6.8 The IERRT development comprises a new roll-on/roll-off terminal in the Port of Immingham and the Grid Reference used for site identification of that project is approximately 920m to the west of the westernmost extent of the Project marine Site Boundary (ID 22 on **Figure 25.1** (PEI Report, Volume III)). The Site Boundary of that project extends eastward to includes areas which are in close proximity to the IGET Site Boundary.

25.6.9 The IERRT development progressed through a statutory consultation between 19 January 2022 and 23 February 2022 and then through a supplementary consultation between 28 October 2022 and 27 November 2022. A Development Consent Order (DCO) application for the IERRT development is expected to be brought forward imminently. The IERRT development and the Project both involve new jetties, are in close spatial proximity and there is the potential for their construction programmes to overlap. This means that there is at least the potential for these developments to interact leading to potential significant cumulative effects.

25.6.10 This potential for the Project and the IERRT development to interact cumulatively will vary depending on the periods of construction and operation for each project and the extent to which these periods overlap. The following cumulative scenarios are possible:

a. IERRT is under construction at the same time as the Project, at least in part
b. IERRT is operational by the time the Project construction commences
c. IERRT and the Project are operational at the same time (this is the expected long-term operational scenario)

25.6.11 Consideration has been given to these scenarios for each of the technical areas within the scope of the EIA of the Project and reported in this PEI Report to consider the potential for cumulative effects. Cumulative effects are most likely to arise where a theoretical pathway exists, which would enable the impacts from the two projects to interact, or, where the impacts act on the same receptor. **Table 25.5** below provides a preliminary assessment of the potential for these effects to arise. Further details for those topics which are ‘scoped in’ by this preliminary assessment are provided in subsequent paragraphs as relevant.

Table 25.5 IERRT and IGET Cumulative Effects Scoping

Chapter	Scoped in	Justification
6: Air Quality	Yes	The construction and operational phases of IERRT and the Project will use Kings Road and Queens Road for HGV access. There is the potential for the two projects to act cumulatively in respect of air quality given this common access route for HGVs. Further consideration is given below to this. The construction and operational phases of IERRT and the Project will both generate emissions to air that could impact on the same locations within the Humber Estuary SAC/SPA/RAMSAR. Further consideration is given to this below.
7: Noise and Vibration	Yes	The construction and operational phases of IERRT and the Project will use Kings Road and Queens Road for HGV access. There is the potential for the two projects to act cumulatively in respect of noise and vibration given this common access route for HGVs as well as other noise impacts arising on the Project's west site. Further consideration is given to this below in **Paragraph 25.6.12**.
8: Nature Conservation (Terrestrial Ecology)	No	Any impacts to terrestrial habitats or species are predicted to be spatially limited for both the Project and IERRT. The Project is not expected to interact cumulatively with IERRT in respect of these issues and potentially significant cumulative effects are not anticipated.
9: Nature Conservation (Marine Ecology) **and** **10: Ornithology**	Yes	There is no certainty at present that cumulative effects can be scoped out. However, mitigation measures will be deployed to mitigate the impacts of the IERRT development and the Project These measures will need to be agreed with Natural England (as they will for the Project). The mitigation measures employed as necessary in respect of each project will minimize the potential for individual effects, such as those resulting from disturbance, arising from each project alone and will also minimize cumulative effects between the two projects through both construction and operation. Further details on mitigation measures to be deployed will be defined in the ES for the Project at which point the potential for cumulative effects on Marine Ecology and Ornithology will be assessed further and reported as necessary

Chapter	Scoped in	Justification
		For the potential for air quality impacts on saltmarsh habitats, please see **6: Air Quality** above and the additional text below in **Paragraph 25.6.12**.
11: Traffic and Transport	Yes	The construction and operational phases of IERRT and the Project will use Kings Road and Queens Road for HGV access. There is the potential for the two projects to act cumulatively in respect of transport impacts given this common access route for HGVs. Further consideration is given below to this in **Paragraph 25.6.12.**
12: Marine Transport and Navigation	Yes	There is no certainty at present that cumulative effects can be scoped out. However, mitigation measures will be deployed to mitigate the impacts of the IERRT project and these measures will need to be agreed with the relevant stakeholders (as they will for the Project). Vessel traffic movements for both schemes will be managed by Humber Estuary Services and its Vessel Traffic Services. The mitigation measures employed as necessary in respect of each project, as defined through the Navigational Risk Assessment process, will minimize the potential for navigational risks, arising from each project alone and so will also minimize cumulative effects between the two projects through both construction and operation. Further details on mitigation measures to be deployed will be defined in the ES for the Project at which point the potential for cumulative effects on Marine Transport and Navigation will be assessed further and reported as necessary.
13: Landscape and Visual	No	Landscape and visual effects have been scoped out of the EIA for IERRT given that the development will take place within the existing port curtilage. Given the nature of the baseline context, cumulative effects due to the IERRT development and the Project could arise but are not likely to introduce new or different significant effects. Similarly, any potential visual cumulative effects are likely to be of negligible magnitude (not significant) and experienced in the wider context of industrial views and infrastructure and are not likely to introduce new or different significant effects.

Chapter	Scoped in	Justification
		Given these reasons, the Project is not expected to interact cumulatively with IERRT in a way which would generate significant cumulative effects.
14: Historic Environment (Terrestrial)	No	Any impacts on terrestrial archaeology are predicted to be spatially limited for both the Project and IERRT. There are no sensitive settings for built heritage. Given both of these reasons, the Project is not expected to interact cumulatively with IERRT and potentially significant cumulative effects on terrestrial historic environment receptors are not anticipated.
15: Historic Environment (Marine)	Yes	There is no certainty at present that cumulative effects can be scoped out. However, mitigation measures will be deployed to mitigate the impacts of the IERRT project and these measures will need to be agreed with the relevant stakeholders (as they will for the Project). The mitigation measures employed as necessary in respect of each project, will minimise the potential for effects on marine archeological resources arising from each project alone and so will also minimise cumulative effects between the two projects through both construction and operation. Further details on mitigation measures to be deployed will be defined in the ES for the Project at which point the potential for cumulative effects on Historic Environment (Marine) will be assessed further and reported as necessary.
16: Physical Processes	Yes	Changes to physical processes are predicted to be spatially limited for both the Project and IERRT. There is however, no certainty at present that cumulative effects can be scoped out. However, mitigation measures will be deployed to mitigate the impacts of the IERRT project and these measures will need to be agreed with the relevant stakeholders (as they will for the Project). The mitigation measures employed as necessary in respect of each project, will minimise the potential for physical process effects arising from each project alone and so will also minimise cumulative effects between the two projects through both construction and operation. Further details on mitigation measures to be deployed

Chapter	Scoped in	Justification
		will be defined in the ES for the Project at which point the potential for cumulative effects on Physical Processes will be assessed further and reported as necessary.
17: Marine Water and Sediment Quality	Yes	Changes to water and sediment quality, are predicted to be spatially limited for both the Project and IERRT. There is however, no certainty at present that cumulative effects can be scoped out. However, mitigation measures will be deployed to mitigate the impacts of the IERRT project and these measures will need to be agreed with the relevant stakeholders (as they will for the Project). The mitigation measures employed as necessary in respect of each project, will minimise the potential for Marine Water and Sediment Quality effects arising from each project alone and so will also minimise cumulative effects between the two projects through both construction and operation. Further details on mitigation measures to be deployed will be defined in the ES for the Project at which point the potential for cumulative effects on Marine Water and Sediment Quality will be assessed further and reported as necessary.
18: Water Quality, Coastal Protection, Flood Risk and Drainage	No	Any changes to water quality in waterbodies (excluding the Humber, covered under marine), are predicted to be spatially limited for both the Project and the IERRT development. In respect of flood risk and drainage both developments would have their own design responses and measures to mitigate any potential effects on the respective sites. Further details for the Project will be provided at the ES stage. The Project is not expected to interact cumulatively with IERRT in respect of these issues and potentially significant cumulative effects are not anticipated.
19: Climate Change	No	The IERRT development and the Project will both generate greenhouse gas emissions during construction but will each have a range of mitigation measures deployed to minimise these effects. Depending on market demand, the operational Project will generate up to 3% of the Government's production capacity target for hydrogen to be used as fuel for the de-carbonisation of the HGV and bus fleets in the UK.

Chapter	Scoped in	Justification
		Neither IERRT nor the Project is expected to impact on the ability for the UK to meet its carbon budget and climate change obligations and no significant cumulative effects are expected.
20: Materials and Waste	No	Any waste and materials impacts are generally expected to be spatially limited for both the Project and IERRT although there is likely to be some use of the same waste management facilities for similar waste streams. Mitigation measures, such as the deployment of the measures set out in a Construction Environmental Management Plan (CEMP) and the Site Waste Management Plan, would be in place for both projects to ensure no significant project specific effects arise. Given this, the Project is not expected to interact cumulatively with IERRT and potentially significant cumulative effects on materials and waste resources are not anticipated.
21: Ground Conditions and Land Quality	No	Any impacts on ground conditions are predicted to be spatially limited for both the Project and IERRT. Mitigation measures, such as the deployment of the measures set out in a CEMP, would be in place for both projects to ensure no significant project specific effects arise. Given this, the Project is not expected to interact cumulatively with IERRT and potentially significant cumulative effects on land quality are not anticipated.
22: Major Accidents and Disasters	No	The potential for major accidents for both IERRT and the Project would be managed down to appropriate levels through the deployment of appropriate safety measures such that no cumulative effects would arise.
23: Socio Economics	Yes	IERRT and the Project are not likely to generate significant adverse socio-economic effects that would interact cumulatively. There may be some beneficial effects, including economic benefits and indirect employment opportunities, which have a greater beneficial effect that would be realised from either project in isolation. However, the influx of workers could potentially lead to an adverse effect on local services when assessed cumulatively, with more workers temporarily residing in the local area. Further consideration will be given to this at the ES stage.

Chapter	Scoped in	Justification
24: Human Health and Wellbeing	No	IERRT and the Project are not likely to generate adverse health effects that would interact cumulatively. Further consideration will be given to this at the ES stage.

25.6.12 Those technical areas which are considered to have the potential to interact cumulatively and are marked as 'scoped in' in **Table 25.5** above and for which additional initial assessment has been undertaken are considered further in the following paragraphs. These represent preliminary assessments, which will be further developed and presented in the ES:

a. **Traffic and Transport**: IERRT operational HGV movements are estimated at approximately 2,000 movements per day. This is substantially greater than the 195 HGVs movements per day predicted during the Project's peak construction phase or the 98 HGV movements per day during the Project's operational phase. It is understood that mitigation measures, such as access enhancements, would be deployed for the IERRT development which will reduce the effects on the transport network to a level which is not significant. Given this, it is considered unlikely that a cumulative effect would arise between the two projects in a scenario when IERRT is operational and the Project is either in construction or operation. If the construction phases of IERRT and the Project overlap the risk of a cumulative effect is not considered likely to be significant due to the limited predicted construction phase impact from the Project and the introduction and management of the traffic for both projects through Construction Traffic Management Plans.

b. **Noise and Vibration:** Should IERRT be consented, background sound levels may be influenced by an increase in road traffic on Queens Road and the A1173, and to a lesser extent by distant activities related to loading and unloading of sea vessels and use of new parking/waiting areas within the existing port area.

   It is considered unlikely that significant cumulative effects from The Project and IERRT would occur on the northern facades of the properties facing Queens Road if either the construction phases or operational phases coincided. This is because the Project traffic passing the Queens Road properties is expected to result in minor or negligible adverse (not significant) effects, and both construction and operation noise effects from the IERRT site are expected to be minor adverse or less (not significant). If the IERRT project is consented, the properties will also benefit from proposed installation of an appropriate package of noise insulation to the northern facades of the properties. It is also considered that the cumulative effects of noise from traffic using Queens Road, if operation of IERRT coincided with construction or operation of The Project, remains at minor adverse or less (not significant), given the proposed installation of an appropriate package of noise insulation to the northern facades of the properties associated with the IERRT proposals.

c. However, there is the potential for cumulative effects of noise from IERRT operational traffic on Queens Road impacting the northern façade of these properties (albeit reduced due to the package of sound insulation to be provided in association with the IERRT proposals) whilst construction or operation of The Project on the West site could impact the southern (rear) facades of the same properties. This will be considered further during the EIA and reported in the ES. As explained in **Table 22.2** of **Chapter 22: Major Accidents and Disasters** further assessment is required of the consequences of the operation of the hydrogen production facility on surrounding land uses in terms of major hazard planning. It is currently anticipated that the continued residential use of seven properties on the west side of Queens Road will need to cease, as residential use is unlikely to be compatible with the operation of the hydrogen production facility on the West Site. A number of businesses are also present in the same area on the west side of Queens Road. It is likely that those businesses are compatible with the operation of the hydrogen production facility. Air Products is currently in discussions with the landowners / occupiers of the seven residential properties with a view to negotiating their acquisition. Where it is not possible to acquire those properties through negotiation, acquisition powers for these properties will be sought through the DCO. In the event of acquisition of the properties for the Project ahead of the construction commencing, an adverse effect on those properties (as assessed in this chapter) would not arise.

d. **Air Quality:** Construction phase and operational phase traffic data on the local road network due to the Project have been reviewed against air quality impact screening criteria published by the Institute of Air Quality Management IAQM)/Environmental Protection UK (EPUK) and criteria published by National Highways. During both construction and operational phases, additional traffic movements due to the Project fall below all air quality impact screening criteria. Both IAQM/EPUK and National Highways guidance suggest that a detailed assessment of air quality impacts from road traffic sources (cumulative or not) is not required where the screening criteria are not met. Therefore, the contribution from the Project's road traffic emissions has not been quantified and it can be concluded that the contribution from that the Project would not have a cumulative effect, if considered together with IERRT, that would be significant.

   The site plant and vessel emissions from construction and operational phases of IERRT and the Project would both generate emissions to air that could impact on the same locations within the Humber Estuary SAC/SPA/RAMSAR. Habitats within the designated areas close to IERRT and the Project are not considered sensitive to construction dust impacts. Salt marsh habitat, the nearest of which is approximately 3km from IERRT and 2.5km from the Project, are sensitive to emissions of NOx and the subsequent deposition of nitrogen. Individually, air quality assessments for both projects have concluded that the air quality effect on saltmarsh habitats is not significant and this lowers the potential for a significant cumulative effect to arise. However, this will be assessed further once the Project's site plant and vessel emissions data are modelled together with the IERRT vessel emissions.

Appropriate mitigation measures will be deployed to mitigate any significant adverse effects of the emissions as appropriate. This will be examined in more detail within the ES.

25.6.13 The ES will provide a detailed assessment of the potential for cumulative effects associated with the Project and the IERRT development. In the event that potentially significant cumulative effects are identified, the ES will identify any mitigation measures that are required to reduce the level of the residual effects to not significant levels.

25.7 Cumulative Effects Information Gathering and Assessment (Stages 3 and 4)

25.7.1 The process of gathering information on the shortlisted developments displayed in **Table 25.4** is ongoing, with the data collated being used to assess the potential interaction of the developments with the Project (Stage 3).

25.7.2 The results of Stage 3 and the full cumulative assessment (Stage 4) will be reported within the ES.

25.8 Limitations

25.8.1 Details regarding the potential for in-combination effects uses information from the assessments contained within the relevant PEI Report technical chapters (**Chapters 6** to **24**). This information is thus subject to the limitations as associated with these preliminary assessments.

25.8.2 With regard to potential cumulative effects, the information included within this chapter is based upon information available at the time of the assessment regarding the environmental effects of the other potential or committed schemes in the vicinity of the Project that have been scoped into the assessment.

25.9 References

Ref 25-1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

Ref 25-2 Department for Transport (2012). The National Planning Policy Statement for Ports.

Ref 25-3 European Commission (2014). Directive 2014/ 52/ EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/ 92/ EU on the assessment of the effects of certain public and private projects on the environment.

Ref 25-4 The Planning Inspectorate (2019). Advice Note Seventeen. Cumulative Effects Assessment (Version 2).

Ref 25-5 UK Marine Policy Statement (2011).

Ref 25-6 Marine Management Organisation (2016). East Inshore and East Offshore Marine Plans.

Ref 25-7 The Town and Country Planning (Development Management Procedure) (England) Order 2015.

G.2	PEIR non-technical summary

Immingham Green Energy Terminal

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume I – Non-Technical Summary

Associated British Ports

December 2022

Document History

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Approved By	Richard Lowe		
Signed	[redacted]	Date	20/12/2022
Document Owner	AECOM		

Table of contents

Tables

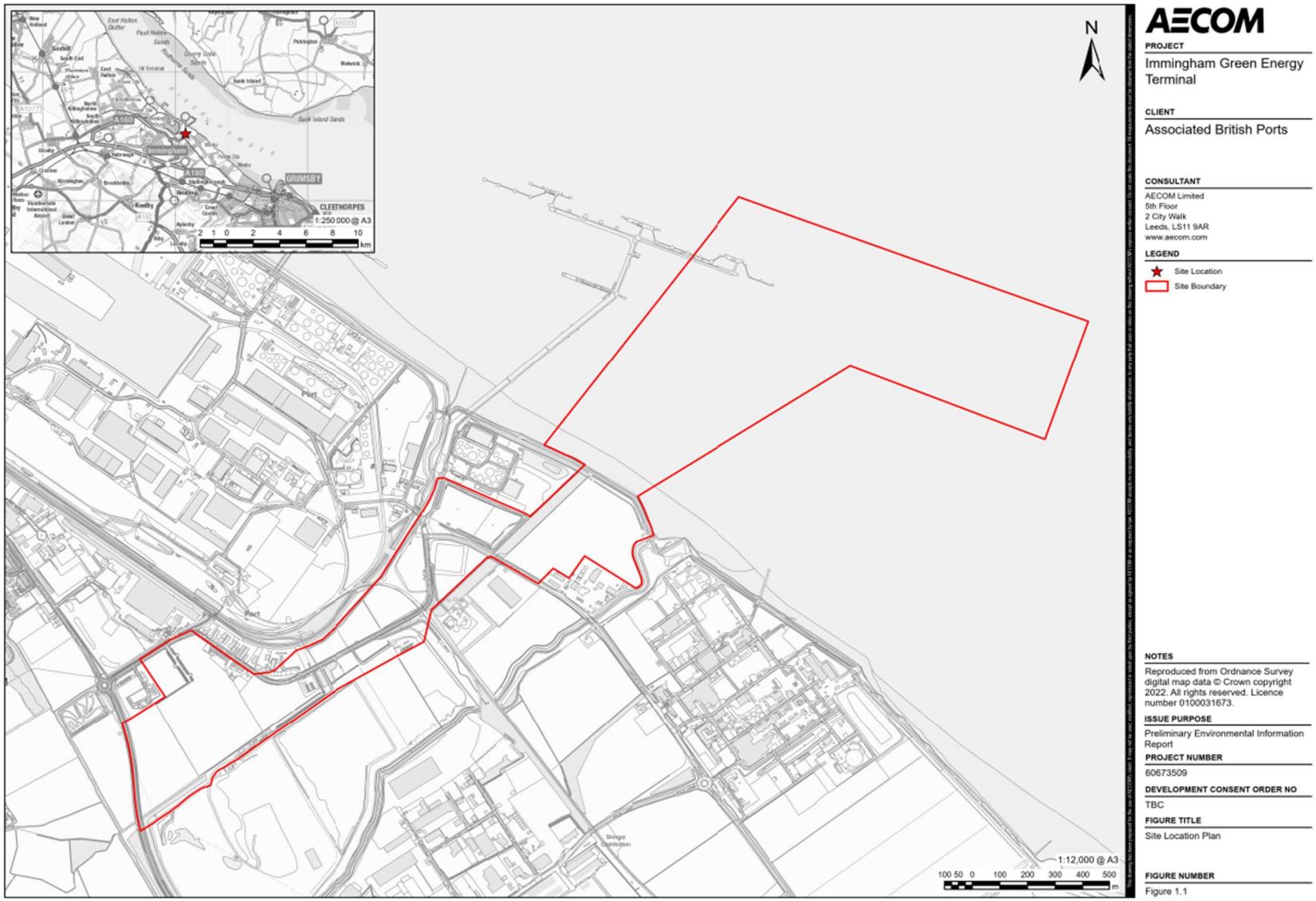
1 Introduction

1.1 Overview

1.1.1 This Preliminary Environmental Information (PEI) Report has been prepared by AECOM Ltd (AECOM) on behalf of Associated British Ports ('ABP') ('The Applicant'). It supports a proposed application ('the Application') to be made to the Secretary of State for Transport seeking Development Consent to construct and operate a multi-user bulk energy liquid jetty and its first associated landside facility as associated development, which would be located on the eastern side of the Port of Immingham (hereafter 'the Port) as shown in **Figure 1.1**. The overall project is called the Immingham Green Energy Terminal (hereafter 'the Project').

1.1.2 This document is the Non-Technical Summary (NTS), Volume I of the Preliminary Environmental Information (PEI) Report. The rest of the PEI Report comprises three further volumes which are the main body (Volume II), figures (Volume III) and appendices (Volume IV).

1.1.3 The PEI Report enables stakeholders and consultees to develop an informed view of the likely significant environmental effects of the Project. The Applicant will take into consideration any comments received through consultation, to identify opportunities for the refinement of the Project design. The Project will be assessed through the ongoing Environmental Impact Assessment (EIA) process and the technical assessments will be brought together in an Environmental Statement (ES) that will accompany the Development Consent Order (DCO) Application.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AECOM
PROJECT
Immingham Green Energy Terminal
CLIENT
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LEGEND
Site Location
Site Boundary
NOTES
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ISSUE PURPOSE
Preliminary Environmental Information Report
PROJECT NUMBER
60673509
DEVELOPMENT CONSENT ORDER NO
TBC
FIGURE TITLE
Site Location Plan
FIGURE NUMBER
Figure 1.1

1.2 Purpose of the Non-Technical Summary

1.2.1 The NTS provides a summary of the information and assessments that have been undertaken and presented in detail in PEI Report Volumes II – IV. The structure of the PEI Report is detailed in **Table 1.1**.

Table 1.1: Structure of the PEI Report

PEI Report Volume I: Non-Technical Summary	
The Non-Technical Summary [This document] is presented in a separate volume and provides a concise and accurate description of the Project, considered alternatives, the environmental baseline, assessment methodology, potential environmental effects and mitigation measures. The NTS is designed to present information about the Project in an accessible format that can be understood by a wide audience. This will assist interested parties in becoming familiar with relevant aspects of the Project.	
PEI Report Volume II: Main Report	
Volume II is the main body of the PEI Report. Its purpose is to detail preliminary results of the environmental assessments being undertaken at the time of writing and based on baseline information available and sourced to date, report on the emerging likely significant effects arising from the Project, and the proposed mitigation measures to alleviate these. The PEI Report is divided into a number of background and technical chapters, each supported by figures and appendices as required. The Table of Contents for the PEI Report is displayed below:	
Chapter 1	Introduction
Chapter 2	The Project
Chapter 3	Need and Alternatives
Chapter 4	Legislative and Consenting Framework
Chapter 5	EIA Approach
Chapter 6	Air Quality
Chapter 7	Noise and Vibration
Chapter 8	Nature Conservation (Terrestrial Ecology)
Chapter 9	Nature Conservation (Marine Ecology)
Chapter 10	Ornithology
Chapter 11	Traffic and Transport
Chapter 12	Marine Transport and Navigation
Chapter 13	Landscape and Visual Impact
Chapter 14	Historic Environment (Terrestrial)
Chapter 15	Historic Environment (Marine)
Chapter 16	Physical Processes

Chapter 17	Marine Water and Sediment Quality
Chapter 18	Water Quality, Coastal Protection, Flood Risk and Drainage
Chapter 19	Climate Change
Chapter 20	Materials and Waste
Chapter 21	Ground Conditions and Land Quality
Chapter 22	Major Accidents and Disasters
Chapter 23	Socio-Economics
Chapter 24	Human Health and Wellbeing
Chapter 25	Cumulative and In-Combination Effects
Chapter 26	Summary of Likely Significant Effects
PEI Report Volume III: Figures	
A complete set of figures provided for reference in Volume III, which support the preliminary assessments set out in Volume II of this PEI Report.	
PEI Report Volume IV: Appendices	
A complete set of appendices provided for reference - this can include background data, technical reports and survey data which support the preliminary assessments set out in Volume II of this PEI Report.	

2 Need for the Project and Consideration of Alternatives

2.1 Need for the Project

2.1.1 The need for the Project arises from Government strategy to deliver the UK's decarbonisation and net zero targets and the subsequent need to provide additional infrastructure to support meeting those targets. Ports will play an important role in industrial decarbonisation through the provision of enabling infrastructure for the energy sector, allowing the technologies and measures needed for a transition to net zero to be deployed.

2.1.2 As such, there is a compelling need to provide port infrastructure, both landside and within the marine area, to meet the growing and changing nature of demand from the energy sector as the transition to net zero gains momentum.

2.1.3 There is a growing need to develop green hydrogen capacity in the UK and while some of this is being facilitated through UK production, the opportunity exists to import green hydrogen from other countries where surplus renewable energy can be harnessed. The safest and most appropriate way to transport hydrogen is in the form of ammonia. As shipping will continue to provide the most effective way to move ammonia in and out of the UK, sufficient port and landside infrastructure is required for its subsequent storage and processing to convert it to hydrogen.

2.1.4 The Project seeks to provide the necessary infrastructure and capacity not only for bulk ammonia imports but also for future carbon dioxide movements including importing captured CO_2 from industrial processes for subsequent permanent storage under the North Sea via the proposed Viking CCS carbon dioxide transport and storage proposals and other potential future users.

2.2 Alternative Sites

2.2.1 While other port locations are potentially available for a Green Energy Terminal, it is considered that the Port of Immingham represents the most suitable location to meet the objectives of this Project for the following reasons:

a. It is an established Port in a central UK location and therefore suitably well connected to import or export green energy bulk liquids into and out of the UK;

b. The Port of Immingham is ideally located to be able to connect to the Viking CCS and East Coast carbon capture and storage clusters – Humberside is one of the main industrial decarbonisation regions being developed in the UK. This is a major differentiator for this location over other UK ports when considering the wider use of the Green Energy Terminal;

c. It is a deep water port with sufficient available adjacent space to construct a new jetty which can accommodate large gas transporter vessels. It is in an industrial location away from large conurbations; and

d. There is space within the area to accommodate the Associated Development of the green hydrogen production facility in close proximity to the jetty (explained further below).

2.2.2 The proposed jetty location within the Port is considered to be the most suitable, given:

a. The need to reach the deep-water channel and minimise interfaces with other vessels;

b. The need for space on the adjacent land side to support a pipeline corridor, storage and production facilities; and

c. The need to make best use of existing infrastructure and services and to facilitate the green hydrogen production facility.

2.2.3 A number of alternative locations within and around the Port have been considered for the green hydrogen production facility taking into account the Port development plans, ground conditions, the presence of existing structures, proximity to residential and ecological receptors, access and proximity to the jetty. The three plots of land identified within the Site boundary were selected as the most suitable for the following reasons:

a. Availability of sufficient largely brownfield land for the development;

b. The west site is allocated for employment use (B1, B2, B8) in the North East Lincolnshire Local Plan. A green hydrogen production facility would be classified as B2 use, comprising development that would be suitable on this site;

c. Proximity to the jetty to minimise onshore transport distances for ammonia, for safety reasons; and

d. Local access to existing gas and grid connections.

2.3 Alternative Technologies

2.3.1 The need for a green hydrogen production facility was identified as an essential part of the Project at an early stage, to align to the Government's ambition to deliver at least 10GW of low carbon hydrogen by 2030 in order to help decarbonise the UK transport sector.

2.3.2 Large scale global deployment of green ammonia is emerging as the safest and most efficient way to transport bulk quantities of green hydrogen from worldwide locations where sustainable solar and wind energy production can be used to make green hydrogen from the electrolysis of water. While transport of green hydrogen could be achieved in other ways, such as direct shipping of hydrogen, the transport risks, costs and scale achievable make alternative transport methods (to the use of ammonia) less viable and more hazardous.

2.3.3 A production facility to subsequently produce and temporarily store green hydrogen from the ammonia is therefore required and there are limited alternative technologies to facilitate this.

3 The Project

3.1 Introduction

3.1.1 The Project would comprise the construction and operation of a terminal to facilitate the import and export of bulk liquids associated with the energy sector. The terminal would consist of a jetty and associated loading / unloading infrastructure, pipelines and metering systems.

3.1.2 Initially, the terminal would be used for the import and export of green ammonia to be converted to green hydrogen. To facilitate this, a hydrogen production facility, comprising associated ammonia handling equipment, storage and processing units would be constructed as part of the Project. The Project is anticipated to produce up to 300MW of hydrogen per annum. Depending on market demand, it is estimated that this will meet up to 3% of Government's hydrogen production capacity target.

3.1.3 Other proposed uses for the green energy terminal will come forward in due course and separately from the Project.

3.2 Key Elements of the Project

3.2.1 As illustrated on **Figure 2.3** (PEI Report, Volume III), the Site is split into the following areas:

a. Terminal - comprising a jetty, including up to two berths and infrastructure to assist with the loading and unloading of vessels, to provide maintenance access and to allow for supporting utilities for handling liquid bulk shipments;

b. A corridor to provide a pipeline from the jetty to the East site and an access road to the jetty from Laporte Road;

c. East Site - ammonia storage and hydrogen production;

d. West Site - hydrogen production, hydrogen liquefaction, hydrogen storage and vehicle loading;

e. Pipeline corridor between the East and West Sites; and

f. Temporary construction areas.

3.3 Construction

3.3.1 Subject to the DCO being granted, there would be a phased approach to the construction of the Project, with the construction of Phase 1 expected to start in early 2025.

3.3.2 **Table 3.1** illustrates an indicative construction timeline for the Terminal. Construction of the first berth is likely to commence in early 2025 and become operational in 2027. Construction of the second berth may commence after the first berth is complete although this would depend on demand and there may therefore be a pause before the second berth is built.

Table 3.1: Indicative Construction Timeline for the Terminal

Berth	Year 1	Year 2	Year 3	Year 4
Berth 1				
Berth 2			Earliest possible start year for Berth 2 (year 1)	

3.3.3 In the marine environment the structures would rest upon an open piled network of steel tubular piles. Driving these piles will likely involve vibro and percussive piling techniques. The deck for the approach trestle and jetty would be supported by either a concrete deck or precast and/or in-situ concrete deck. The topside pipework would be manufactured off-site and floated and/or craned into position. The high-level walkways between dolphins would be manufactured off-site and lifted into position.

3.3.4 It has been determined that an initial dredge would be required to provide the larger western berth. At this preliminary stage, the maximum extent of the dredge is currently estimated at being approximately 45,000m^2. The area in which ships would be berthed would be dredged to maintain a maximum depth of approximately 16m below mean sea level. The dredge volume associated with construction and in particular the creation of the jetty berths would be up to 100,000m^3 of boulder clay and sand/silt. The dredged material would be taken to licensed disposal sites in the Humber.

3.3.5 For the purposes of the PEI Report, it is assumed that the green hydrogen production facility would be constructed incrementally to increase the processing capacity as the market for green hydrogen increases. Construction of the green hydrogen production facility would likely commence in early 2025, and as detailed in **Table 3.2**, with construction undertaken over six phases and full completion taking an eleven-year period. It is assumed that each phase of the green hydrogen production facility would become operational following its construction.

Table 3.2: Indicative Construction Phasing Timeline for the Green Hydrogen Production Facility

Phase	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Phase 1											
Phase 2											
Phase 3											
Phase 4											
Phase 5											
Phase 6											

3.3.6 The start of construction of Phase 2 (here shown in Year 4), will depend on a number of factors including market demands for hydro

3.3.7 gen at that point in time and the timing of subsequent phases would be subject to the same tests. Construction of Phases 2 – 6 may take eight years if built consecutively as shown in **Table 3.2**.

3.3.8 Each phase of the Project's development would involve construction of buildings and infrastructure within the relevant area of the Site, as presented in **Table 3.3**.

Table 3.3: Anticipated Buildings and Infrastructure within the Site by Phase

Phase	Jetty	Pipeline Corridors	East Site	West Site
Phase 1 **Construction:** **Y1 – Y3**	Jetty structure and Berth 1 Berth 2 (start) Jetty topside infrastructure	Ammonia pipeline from the jetty Jetty access road Hydrogen, Ammonia and Natural Gas pipelines between East and West Site Utilities and cabling to East and West sites	Ammonia tank One hydrogen production unit Internal access roads, drainage and utilities	One liquefier Tanker loading bays Administrative offices Other supporting building and facilities Internal access roads, drainage and utilities
Phase 2 **Construction:** **Y4 – Y5 (TBC)**	Berth 2 (complete)			One hydrogen production unit One liquefier
Phase 3 **Construction:** **Y6 – Y7 (TBC)**			One hydrogen production unit	One liquefier

Phase	Jetty	Pipeline Corridors	East Site	West Site
Phase 4 Construction: Y8 – Y9 (TBC				One liquefier One hydrogen production unit
Phase 5 Construction: Y9 – Y10 (TBC)			One hydrogen production unit	
Phase 6 Construction: Y10 – Y11 (TBC)				One hydrogen production unit

3.3.9 The Applicant would require the construction contractor to produce and maintain a Construction Environmental Management Plan (CEMP) to control construction activities to minimise, as far as reasonably possible, impacts on the environment. An Outline CEMP will be produced and appended to the ES as part of the DCO application and the contractor's CEMP will need to be prepared in accordance with the principles set out in the Outline CEMP.

3.4 Operation and Maintenance

Hydrogen Production Facility Operation

3.4.1 The hydrogen production facility is intended to be a continuous operation. The intention is therefore that the facility would operate 24 hours a day, seven days a week and 365 days a year. It is anticipated that once fully operational, a fleet of up to 50 tanker trailers and tractor units would operate in distributing the green hydrogen throughout the UK. The fleet would operate 24 hours a day.

Terminal Operation

3.4.2 The Terminal will operate 24 hours a day, seven days a week and 365 days a year (though with lower activity at night compared to the day). The Terminal would have capacity to accommodate up to 400 vessel calls per year and it is anticipated that up to 12 of these calls would be associated with the import of green ammonia for the hydrogen production facility.

Maintenance Dredging and Disposal

3.4.3 During operation of the Project, periodic maintenance dredging to maintain the depth beneath the jetty berths would be required. The overall volumes of the maintenance dredging associated with the Project would be smaller than that required during the construction phase. An estimate of the annual future maintenance dredge volume will be provided in the ES.

3.5 Decommissioning

3.5.1 The Project does not make any provision for the decommissioning of the marine facilities of the Project. This is because the marine facilities would, once constructed, become part of the fabric of the Port estate and would be maintained accordingly.

3.5.2 The landside elements of the Project have a design life of approximately 25 years, although their operational life could be longer, depending on their integrity and market conditions at that time. When appropriate, this infrastructure would be decommissioned.

3.5.3 Decommissioning would be undertaken safely, in line with specific procedures and subject to risk assessment and permit to work schemes, and with regard to the environmental legislation at the time of decommissioning. The required licences and permits would also be acquired.

3.5.4 Decommissioning of the landside elements of the Project would likely involve leaving any emptied underground pipelines in situ and making them safe. The plant would be modular which would make decommissioning easier. All above ground infrastructure associated with the Project would likely be dismantled and all materials removed would be reused or recycled where possible or disposed of in accordance with relevant waste disposal regulations at the time of decommissioning. Land would be restored to a satisfactory state. If required and appropriate, refurbishment or replacement of specific plant would be performed to extend the life of the Project.

3.5.5 A Decommissioning Environmental Management Plan (DEMP) will be produced prior to decommissioning or demolition works being undertaken, which will detail measures to be implemented to avoid or reduce environmental impacts during the decommissioning of the landside elements. The provision of a DEMP will be secured by requirement of the DCO.

4 Consultation

4.1.1 Consultation is integral to the preparation of DCO applications and to the EIA process. The views of consulted parties and the local community serve to focus the environmental studies undertaken to inform the EIA and to identify specific issues that require further investigation, as well as to inform aspects of the Project design. Consultation is an ongoing process up to submission of the DCO application and the publication of this PEI Report forms an important part of that process.

4.1.2 The Project has a wide range of stakeholders with differing interests. Specific communication activities will be undertaken to meet the needs of specific individuals and groups. This requires an understanding of the stakeholders and their interests in the Project.

4.1.3 The key stakeholders to be consulted as part of the pre-application process include (but are not limited to):

a. Prescribed statutory bodies;

b. Local authorities;

c. Landowners/those with interests in the land;

d. Local communities; and

e. Other key interest groups.

4.1.4 In addition to the stages of pre-application consultation, the Applicant will hold informal engagement with the key prescribed consultees, as appropriate, to refine the Project and the EIA and to assist in the development of any required mitigation or other environmental measures.

5 Summary of Preliminary Environmental Effects

5.1 Introduction

5.1.1 The PEI Report presents a description of the Project and its likely significant environmental effects during construction, operation (including maintenance, where relevant) and decommissioning, based on the preliminary environmental information available at the time. It also details measures to avoid or reduce such effects and the alternatives considered.

5.1.2 The PEI Report summarises the outcome to date of the following ongoing EIA activities:

a. Scoping opinion;

b. Review of secondary information, previous environmental studies, publicly available information and databases;

c. Physical surveys and monitoring;

d. Establishing baseline conditions (the environment as it currently is without the Project);

e. Consultation with statutory and non-statutory consultees;

f. Consideration of relevant local, regional and national planning policies, guidelines and legislation relevant to the EIA;

g. Reference to current guidance;

h. Consideration of technical standards for the development of effect significance criteria and specialist assessment methodologies;

i. Desk-top studies;

j. Design review;

k. Modelling and calculations; and

l. Expert opinion.

5.1.3 These activities enable the prediction of impacts of the projects in relation to the current and future baseline[1], and a prediction based on the information available of the likely significance of effects on environmental receptors[2].

5.1.4 The term ‘impact’ refers to changes arising from the Project, whereas the term ‘effect’ is used to describe the result of the impact on a receptor.

5.1.5 **Table 5.1** shows the generic significance evaluation matrix that has been applied to the assessment of this Project. **Table 5.2** explains the generic significance of effect description.

[1] Also known as the ‘Do-Minimum scenario’, the minimum works that are likely to go ahead in the absence of the Project. The future baseline scenario has been set as Q2 2025 for the Project.
[2] Receptors have the potential to be affected by the construction, operation and decommissioning of the Project, this can include designated environmental sites, humans and protected species. Receptors that could potentially be affected by any stage of the Project are clearly defined in each technical chapter.

Table 5.1: Generic Significance Evaluation Matrix

		Magnitude of Change			
		Very Low	Low	Medium	High
Sensitivity of Receptor	High	Minor (not significant)	Moderate (potentially significant)	Major (significant)	Major (significant)
	Medium	Minor (not significant)	Minor (not significant)	Moderate (potentially significant)	Major (significant)
	Low	Negligible (not significant)	Minor (not significant)	Minor (not significant)	Moderate (potentially significant)
	Very Low	Negligible (not significant)	Negligible (not significant)	Minor (not significant)	Minor (not significant)

Table 5.2: Generic Significance of Effect Description

Significance Category	Indicative Description
Major	Very large or large change in environmental conditions. Effects, both negative and positive, which are likely to be important considerations at a national to regional level because they contribute to achieving national or regional objectives, or which are likely to result in exceedance of statutory objectives or breaches of legislation. These effects are considered to be very important considerations and are likely to be material in the decision-making process.
Moderate	Intermediate change in environmental conditions. Effects are likely to be important considerations at a regional or local level and important in informing the decision-making process.
Minor	Small change in environmental conditions that are unlikely to be critical in the decision-making process.
Negligible	No discernible change in environmental conditions. An effect that is likely to have a neutral or negligible influence.

5.1.6 Further explanation of the approach to assessing impacts and effects, and the specific criteria to be used for each topic is set out in **Chapter 5: EIA Approach** (PEI Report, Volume II), with any deviation from this standard approach noted.

5.1.7 For each environmental topic the EIA process systematically identifies impacts and effects and take into consideration environmental measures that the Project would adopt. These environmental measures include avoidance, best practice and design commitments as follows:

5.1.8 Embedded Mitigation Measures: modifications to the location, design or operation of a development made during the pre-application phase that are an inherent part of the Project and do not require additional action to be taken.

5.1.9 Standard Mitigation Measures: measures comprising management activities and techniques, which would be implemented during construction or operation of the Project to limit impacts through adherence to good site practice and achieving legal compliance.

5.1.10 Additional Mitigation Measures: these comprise measures over and above any embedded and standard mitigation measures, for which the EIA has identified a requirement to further reduce significant environmental effects.

5.1.11 Each technical chapter within the PEI Report (**Chapters 6** to **24**, Volume II) follows the same structure for ease of reference, where appropriate, as follows:

a. Introduction;
b. Approach to assessment;
c. Baseline conditions;
d. Design, mitigation and enhancement measures;
e. Potential impacts and effects;
f. Residual effects and whether significant or not; and
g. Summary of preliminary assessment.

5.1.12 A summary of each technical chapter's assessment for the Project is presented below. For a full assessment, refer to the corresponding technical chapter (**Chapters 6** to **24** in the PEI Report, Volume II).

5.2 Air Quality

5.2.1 **Chapter 6: Air Quality** includes a review of available data sources and the results of a nitrogen dioxide diffusion tube survey in order to characterise baseline conditions. Background pollutant concentrations for NO_X, NO_2, PM_{10} and $PM_{2.5}$ provided by Defra and NO_2 concentrations from the local air quality monitoring network have been presented as part of the baseline. Air quality is currently monitored by North East Lincolnshire Council and North Lincolnshire Council. North East Lincolnshire Council's monitoring data from 2021 and North Lincolnshire Council's from 2019 indicate NO_2 concentrations below their air quality objective.

5.2.2 With the implementation of standard construction practices that will be outlined in the Outline CEMP, it is considered that the residual construction phase air quality effects due to the Project would be insignificant.

5.2.3 Air quality effects during the Project operational phase, taking into account emissions from site plant, operational vessels and traffic, have been considered. This preliminary assessment indicates that these sources would have insignificant air quality effects given the controls that will be put in place including the use of appropriate stack heights for any releases of emissions to air. Operation of the facility will be regulated by the Environment Agency through an

Environmental Permit, which will specify emissions monitoring requirements and emission limits that must not be exceeded.

5.3 Noise and Vibration

5.3.1 **Chapter: 7 Noise and Vibration** details that sources contributing to the baseline sound environment at Noise Sensitive Receptors (NSRs) in the vicinity of the Project are primarily road traffic and industrial/commercial/port activities. There are three NSRs within the vicinity of the Project covering the northern and southern end of Queens Road and the eastern edge of Immingham. Existing noise levels are currently dominated by traffic noise from Queens Road and also wind rustle in surrounding scrub. Other sources include factory noises, more distant traffic and distant playground noise from nearby schools. Assessments for daytime and night-time and for each phase of the Project were undertaken in line with British Standard BS4142 (Ref 1-13).

5.3.2 Mitigation measures that are being considered as part of the Project design development for both the construction and operational phases include:

a. Limits on noise emissions from plant and equipment at source;

b. Acoustic barriers/screens or earth bunds to reduce transmission of noise; and

c. Recommendation for the provision of a package of sound insulation to nearby NSRs as a last resort, where other applied measures are unlikely to be adequate.

5.3.3 Based on the implementation of the impact avoidance measures and following implementation of additional noise specific measures (which would be included in the Outline CEMP), the preliminary assessment indicates that construction noise effects at residential NSRs on Queens Road may be moderate adverse (and thus significant) due to on-site works and off-site traffic. However, as explained in **Table 22.2** of **Chapter 22: Major Accidents and Disasters** (PEI Report, Volume II), further assessment is required of the consequences of the operation of the hydrogen production facility on surrounding land uses in terms of major hazard planning. It is currently anticipated that the HSE will advise against the continued use of the seven residential properties (the residential NSRs) on the west side of Queens Road and therefore that those residential properties are likely to need to be acquired for the Project. Air Products is currently in discussions with those landowners/occupiers with a view to negotiating acquisition of the seven residential properties. Where it is not possible to acquire those properties through negotiation, acquisition powers for these properties will be sought through the DCO. In the event of acquisition of the properties ahead of the either construction or operation commencing, the adverse effect would not arise.

5.4 Nature Conservation (Terrestrial Ecology)

5.4.1 **Chapter 8: Nature Conservation (Terrestrial Ecology)** characterises the baseline environment by identifying the statutory and non-statutory designated sites in the vicinity of the Project, as well as presenting records of known habitats and protected species in the area, which have been gathered through a combination of survey work and desk-based study. There are no terrestrial

statutorily designated sites with Impact Risk Zones that overlap the Site boundary or that have qualifying interest features of relevance to the assessment. The marine elements of the Project are located within the Humber Estuary European Marine Site which is covered in **Section 5.5.** The closest non-statutory site is the Laporte Road Brownfield Site Local Wildlife Site which is located approximately 150m south-east of the Site boundary. The Site is relatively poor for protected species although small number of bats have been recorded near the Long Strip woodland and water voles and otters have been recorded in nearby ditches.

5.4.2 The Project has been designed, as far as possible, to avoid and minimise impacts and effects to terrestrial ecology through the process of design development, and by embedding mitigation measures into the design. This includes minimising lighting impacts through an indicative lighting strategy for the Project. In addition, the following measures would be included in the Outline CEMP to mitigate potential terrestrial ecology effects:

a. An Environmental or Ecological Clerk of Works would be present during construction;

b. Precautionary working methods would be adopted to manage any residual risk of protected species being encountered e.g. reptiles, and a Precautionary Working Method Statement would be prepared as part of the CEMP;

c. Precautionary measures would be implemented to prevent trapping wildlife in construction excavations, in order to ensure compliance with animal welfare legislation; and

d. Construction temporary lighting would be arranged so that glare would be minimised outside the construction site.

5.4.3 Taking into account the mitigation measures detailed above, the residual effects of the Project in relation to terrestrial ecology have been assessed. The preliminary assessment identifies that there is limited potential for significant adverse effects on terrestrial ecology features. This is because the land affected by the Project is generally of low biodiversity value and surveys undertaken to date indicate that there is little potential for protected and notable species to occur. However, the Project could result in the loss of a large part of the deciduous Long Strip woodland during construction of the pipeline to the jetty and the jetty access road, resulting in a potential moderate adverse effect on woodland habitat, which would be significant. Mitigation measures for woodland loss, including off site woodland planting, are being explored and will be further reported in the ES. All other terrestrial ecology effects are expected to be not significant.

5.5 Nature Conservation (Marine Ecology)

5.5.1 **Chapter 9: Nature Conservation (Marine Ecology)** characterises the baseline environment by presenting a summary of the relevant designated sites, including the Humber Estuary Special Area of Conservation, Ramsar and Site of Special Scientific Interest, protected species, benthic habitats and species, fish and marine mammals using desk-based sources. A site-specific subtidal survey was also undertaken to collect samples for macrofaunal analysis and Particle Size

Analysis. The Project falls within the boundaries of the Humber Estuary Special Area of Conservation, Special Protection Area and Ramsar site (collectively forming the Humber European Marine Site). The primary reason for designation of the Special Area of Conservation is the presence of estuary and mudflats and sandflats habitats whilst the Special Protection Area is designated for its international importance for wader and wildfowl (ducks and geese) populations (covered further under Ornithology below).

5.5.2 In order to minimise and avoid effects on marine ecology, the Project aims to minimise the requirements for dredging as far as possible. In addition, standard mitigation measures being considered for implementation during the Project construction phase includes the use of soft start procedures for piling, the use of vibro piling where possible and if necessary seasonal/night-time piling restrictions specifically for migratory fish species and to meet Joint Nature Conservation Committee piling protocols for marine mammals. If required, these measures would reduce the level of potential impact associated with underwater noise and vibration on fish and marine mammals. Other measures include the even disposal deposition of dredged material across disposal sites, adherence to biosecurity management procedures and application of environmental management best practice to manage the risk of accidents and spillages/leaks during construction.

5.5.3 Taking into account the mitigation measures as detailed above, the preliminary assessment indicates that effects on marine ecology receptors, including habitats, would not be significant.

5.6 Ornithology

5.6.1 **Chapter 10: Ornithology** characterises the baseline environment by presenting a summary of the relevant designated sites, including the Humber Estuary Special Protection Area, Ramsar and Site of Special Scientific Interest, protected species and coastal waterbirds using desk-based sources at this preliminary stage. The Project falls within the boundaries of the Humber European Marine Site. The Humber Estuary Site of Special Scientific Interest overlaps part of Study Area and is designated for its nationally important habitats of intertidal mudflats and sandflats, and coastal saltmarsh) geological interest, its importance to breeding, wintering and passage birds, breeding grey seals and the presence of river and sea lamprey. The Humber Estuary is a site of national and international importance for its wader and wildfowl (ducks and geese) populations.

5.6.2 Potential impacts on coastal waterbirds as a result of the construction phase of the Project have been assessed on a preliminary basis. The following impact pathways were assessed:

a. Direct loss to intertidal feeding and roosting habitat as a result of the piles;

b. Direct loss of terrestrial habitat that is functionally linked to the Humber Estuary Special Protection Area/Ramsar;

c. Direct loss of breeding habitat used by non- Special Protection Area/ Ramsar birds;

d. Indirect changes to intertidal foraging and roosting habitat as a result of changes to hydrodynamic and sedimentary processes; and

e. Airborne noise and visual disturbance to coastal waterbirds using intertidal habitats and functionally linked terrestrial habitats outside the boundary of the Humber Estuary Special Protection Area/ Ramsar Site.

5.6.3 Standard mitigation measures which are being considered include undertaking vegetation clearance outside the nesting bird season where possible, or where not possible then pre-clearance checks will be undertaken.

5.6.4 A potential requirement for additional mitigation was identified to mitigate for the loss of the arable land within the temporary construction compound off Laporte Road, if it is concluded to be functionally linked to the Humber Estuary. Additional mitigation is also being considered in relation to the potential disturbance of coastal waterbirds during construction. Possible mitigation measures being considered include the use of soft start procedures for piling during construction, cold weather construction restrictions, seasonal working restrictions and the use of acoustic barriers and screening.

5.6.5 Taking into effect the mitigation measures detailed above, the residual effects in ornithology receptors have all been assessed as not significant with the level of confidence in these predictions ranging from low to high at this preliminary stage.

5.7 Traffic and Transport

5.7.1 **Chapter 11: Traffic and Transport** characterises the baseline environment by presenting the local highway network, cycle networks, public rights of way and existing traffic flows using survey data and other desk based sources. The existing baseline highway network comprises an area that is largely industrial in nature, with very few residential properties. The only major residential area is the town of Immingham located to the south of the Port. In terms of National Cycle Networks and Public Rights of Way, there are no routes within this area that would likely be affected by traffic associated with the Project based on the proposed traffic routing. During the construction and decommissioning phases, there may be temporary impacts on the use of the Bridleway which runs from Laporte Road to the Humber and would be either closed or diverted in these periods.

5.7.2 Traffic and transportation impacts during construction would be managed by minimising waste generation as far as is possible as this would minimise the need for traffic trips. In addition, all access points onto Site that require the creation of a junction would be designed in accordance with the Design Manual for Road and Bridges and in consultation with the local highway authority.

5.7.3 Prior to the start of the construction phase, the contractor would prepare a Construction Traffic Management Plan to control Heavy Goods Vehicle movements, as well as a Construction Worker Travel Plan to control the trips made by construction workers (including encouraging car sharing) and thus reduce the impact of the workforce upon the highway network. These plans would set out measures and controls to limit the number of trips on the network in the peak hours, and as such would aim to limit the traffic impact of the construction phase as far as possible.

5.7.4 With the implementation of the measures above, the preliminary assessment indicates that traffic and transport effects associated with the peak construction phase for the Project would be negligible or minor, and therefore not significant.

5.7.5 Operational traffic flows would be significantly less than those occurring during the peak of Project construction and so traffic and transportation effects during Project operation would also be not significant.

5.8 Marine Transport and Navigation

5.8.1 **Chapter 12: Marine Transport and Navigation** characterised the existing vessel activity in the vicinity of the Site boundary using 12 months of Automatic Identification System to ensure seasonal variations were considered. This recorded passing cargo vessel tankers, passenger ships, fishing vessels, recreational vessels, etc., as well as port-related vessel movements such as pilot vessels and tugs. The Project, if consented, will be located fully within an extended Port of Immingham Statutory Harbour Authority area where the Applicant is the Statutory Harbour Authority. A sample of vessels transiting the river in the vicinity of the Project recorded two vessels, a cargo vessel and a tanker, crossing the Project during this period. A number of other vessels passed to the north, including a passenger vessel.

5.8.2 Historical maritime incidents and accidents were also researched and analysed from a variety of sources including Humber Estuary Services and the Royal National Lifeboat Institution (RNLI). The most common incidents were collisions (between vessels), contacts (with port infrastructure), groundings, and equipment failure.

5.8.3 The potential hazards to marine transport and navigation as a result of the construction and operation of the Project have been identified, which included collision, contacts, groundings and equipment failure. A preliminary list of standard industry mitigation measures has been identified which is appropriate to the construction and operational activities being undertaken, such as construction method statements and allowable weather limits.

5.8.4 During the formal risk assessment process undertaken as part of the Navigational Risk Assessment, more detailed and specific mitigation measures will be evaluated through the use of vessel simulations and consultation with stakeholders at a local hazard review workshop. The objective of the Navigational Risk Assessment will be to ensure all residual navigational risks are either broadly acceptable or tolerable with suitable risk controls in place. The Navigational Risk Assessment, when finalised, will be appended to the ES.

5.9 Landscape and Visual Impact

5.9.1 **Chapter 13: Landscape and Visual Impact** characterises the baseline environment in the vicinity of the Project by presenting the surrounding National Character Areas (NCA), Regional Character Assessments (RCA) and Local Character Assessments as well as the development of a Zone of Theoretical Visibility (ZTV) for the Project. The Project is partly located within National Character Area 41: Humber Estuary. The character area is broadly split into two components, the largest being the expanse of water associated with the Humber

Estuary which, due to its strategic position, facilitates important, busy trade routes. The land adjacent to the coast is described as a '*low-lying estuarine landscape with extensive stretches of intertidal habitats*'.

5.9.2 Views within the wider study area are generally extensive due to the low-lying land along the coast and lack of intervening vegetation. Visibility is restricted within closer proximity to the Site by existing buildings, infrastructure and vegetation.

5.9.3 The Project is being designed, as far as possible, to avoid and minimise impacts and effects to landscape/seascape and visual receptors through the process of design development, and by embedding mitigation measures into the design. The provision of landscape planting will be considered further at the ES stage but on-site opportunities would be limited. Mitigation will be implemented during construction to ensure the protection of retained trees with appropriate root protection areas, and these will be clearly marked in the CEMP. Proposed construction mitigation includes perimeter fencing, maintaining tidy sites and temporary screen bunding.

5.9.4 The preliminary landscape and seascape assessment has not identified any significant effects during the construction phase or operation of the Project. However, the preliminary visual amenity assessment indicates that potential significant adverse visual amenity effects could be experienced at some representative viewpoints, including residential receptors on Queens Road, during Project construction, operation and decommissioning. The visual amenity effects associated with the Project will be re-assessed once further design details are available and once mitigation features are further developed.

5.9.5 As explained in **Table 22.2** of **Chapter 22: Major Accidents and Disasters** (PEI Report, Volume II), further assessment is required of the consequences of the operation of the hydrogen production facility on surrounding land uses in terms of major hazard planning. It is currently anticipated that the HSE will advise against the continued use of the seven residential properties (the residential NSRs) on the west side of Queens Road and therefore that those properties are likely to need to be acquired for the Project. Air Products is currently in discussions with those landowners / occupiers with a view to negotiating acquisition of the seven residential properties. Where it is not possible to acquire those properties through negotiation, acquisition powers for these properties will be sought through the DCO. In the event of acquisition of the properties ahead of the either construction or operation commencing, the adverse effect would not arise.

5.10 Historic Environment (Terrestrial)

5.10.1 **Chapter 14: Historic Environment** characterises the baseline historic environment (terrestrial) in the vicinity of the Project. This confirms that there are no World Heritage Sites, Scheduled Monuments, Grade I and II* listed buildings, conservation areas, registered parks and gardens, registered battlefields within the 2km study area for designated heritage assets. There are, however, three Grade II listed buildings of medium value located within the 2km study area, comprising of the Immingham War Memorial, Churchfield Manor and an Iron Bungalow.

5.10.2 Archaeological investigation has found evidence of a high-status Roman settlement and industrial site, located approximately 1.4km south-west of the Project Site. There is one asset (pair of ditches) of prehistoric date recorded within the 1.6km study area. An undated possible oval enclosure situated to the east of the West Site, outside of the Site boundary, could be related to the Roman settlement. Undated cropmarks of rectangular ditched enclosures, located approximately 1.1km to the south-east of the Site centre, could form part of the Roman landscape.

5.10.3 There is evidence for medieval (AD 1066-1540) settlement activity within the study area, to the west of the Site boundary, including a possible deserted medieval settlement. Aerial photography has recorded the remains of post-medieval field boundaries and narrow ridge and furrow cultivation features at Harborough Marsh as well as the presence of either singular or a series of drainage ditches.

5.10.4 Within the study area, a series of historic roads and trackways of post-medieval date are recorded on the early Ordnance Survey (OS) maps which may have origins in the medieval period. Several woodland features are located within the study area.

5.10.5 Multiple modern era (1901-present) features are found within the study area including historic flood defences, Immingham Dock and its associated features and World War II activity.

5.10.6 The Project has been designed, as far as possible, to avoid and minimise environmental impacts and effects through the siting of the Project. However, there are eight non-designated heritage assets recorded in the study area that have the potential to be subject to physical impacts or impacts to the significance of assets as caused by changes to their setting as a result of the construction of the Project. Of these the preliminary assessment indicates six potentially significant effects upon non-designated heritage assets that would be impacted by Project construction activities on the Site. However, until the results of the archaeological evaluations are available, it is not possible to confirm the significance of the effects. The significance of effects on the historic environment (terrestrial) will therefore be revisited in the ES, taking account of the evaluation results.

5.10.7 The preliminary assessment predicts that it would be possible to mitigate the Project's potential impact upon any buried archaeological resource found by chance at the Project Site through a staged programme of archaeological investigation using the approach and programme defined in a Written Scheme of Investigation. The purpose of the investigation would be to ensure that any remains are recorded prior to construction activities commencing. The first stage would consist of evaluation measures to identify the extent and survival of archaeological remains, followed, where required, by the excavation of features to ensure that they are fully understood and recorded. Any further stages of archaeological excavations, such as strip map and record, would be designed using the results of the evaluations. Archaeological mitigation requirements will be detailed in the Outline CEMP.

5.11 Historic Environment (Marine)

5.11.1 **Chapter 15: Historic Environment (Marine)** presents a marine archaeological baseline study of the Site based on desk-based assessment of records held by national and local inventories and secondary sources relating to the marine and intertidal historic environment. This archaeological baseline also includes an assessment of the value and sensitivity of any identified marine or intertidal archaeological receptors within the Site.

5.11.2 The study area for the marine archaeology topic comprises the footprint of the marine works associated with the Project and a 2km buffer zone. Twenty known heritage receptors have been identified within the study area, including seven records of wrecks, with two considered likely to still be located on the riverbed out with the Site boundary. There is also the potential for as yet undiscovered heritage receptors to be present within the study area. Within the study area, no features have been confirmed as having high archaeological value.

5.11.3 The preliminary assessment has identified that the construction phase would potentially result in adverse impacts on known and potential marine heritage receptors.

5.11.4 These impacts are associated with:

a. Construction of port infrastructure; and

b. Capital dredging.

5.11.5 The following mitigation measures are being considered as a result of the marine historic environment assessment:

a. Archaeological assessment of geophysical surveys undertaken to support the Project design, which would support baseline enhancement and identification of unknown marine cultural heritage receptors;

b. Geoarchaeological assessment of any future obtained marine borehole logs obtained as part of the detailed design ground investigation, which would enhance the baseline understanding of submerged palaeolandscapes;

c. Avoidance of known marine cultural heritage receptors through , for example, Implementation of Archaeological Exclusion Zones, if required; and

d. A Protocol for Archaeological Discoveries to ensure reporting and investigation of unexpected archaeological discoveries encountered during Project construction activities.

5.11.6 During construction, the application of the mitigation as suggested above through further investigation could result in the confirmation that either:

a. There are no marine heritage receptors located within the Project footprint, therefore confirming no adverse effects; or

b. That marine heritage receptors are present but can be avoided through the use of Archaeological Exclusion Zones, leading to negligible adverse effects.

5.11.7 Should seabed prehistory receptors be confirmed at the Site, a positive effect could be achieved through contributing to the knowledge base of seabed

prehistory receptors, for example through geophysical and geoarchaeological assessment.

5.11.8 With the implementation of the appropriate mitigation measures, marine archaeology effects are predicted to be negligible and not significant during the Project operational phase. It is anticipated that further details on the measures will be provided at the ES stage.

5.11.9 The DCO would not make any provision for the decommissioning of the marine infrastructure above and below water level. As such, no impacts are therefore considered for the decommissioning phase.

5.12 Physical Processes

5.12.1 **Chapter 16: Physical Processes** characterises the baseline environment by summarising the bathymetry and morphology of the Humber Estuary, the tides and water levels, extreme water levels, sea level rise predictions, flows, waves and geology and sediments using desk-based sources at this preliminary stage. The Humber Estuary has a meandering funnel shape widening towards the mouth. The form of the estuary can be divided into three regions for the consideration of physical processes:

a. The Inner Humber (Trent Falls to Humber Bridge): characterised by a number of extensive intertidal banks composed of sand/silt;

b. The Middle Humber (Humber Bridge to Grimsby): similar in its characteristics to the Inner Humber; and

c. The Outer Humber (Grimsby to Spurn Point): dominated by a three-channel system at the mouth, a large, submerged sandbank, and a single deep channel leading to the Middle Humber.

5.12.2 The Humber Estuary is tidal with a mean spring tidal range between 5.7m to 7.4m.

5.12.3 Embedded mitigation includes minimising the dredge requirements as far as possible to minimise changes in physical processes.

5.12.4 The assessment considers the extent of the changes to hydrodynamic and sedimentary processes and informs the assessment of effects in other chapters such as **Chapter 9: Nature Conservation (Marine Ecology)** and **Chapter 17: Marine Water and Sediment Quality**. Numerical modelling tools and conceptual analyses have been used to predict coastal processes and hydrodynamic effects by comparing the baseline and future environmental conditions created by the Project. This includes predicting the changes to tidal water levels, currents, and waves. It also includes modelling of sediment transport pathways (including assessment of potential changes to erosion and accretion patterns) and the fate of sediment plumes from marine construction and maintenance dredging and disposal activities.

5.12.5 Overall, the physical processes changes brought about by the construction and operation of the Project are currently considered small in both magnitude and extent and the resultant exposure to change assessed as low. The consequent significance of effects resulting from physical processes changes on other

environmental features/ receptors would be assessed in other topic-specific chapters.

5.13 Marine Water and Sediment Quality

5.13.1 **Chapter 17: Marine Water and Sediment Quality** characterises the baseline environment by identifying waterbodies, water-related protected areas, and water quality monitoring sites. There are no Shellfish Water Protected Areas or Sensitive Areas in the vicinity of the Project and the nearest Bathing Water is over 11km away. The available information on sediment quality in the vicinity of the Site has also been summarised using desk-based sources. The Humber Lower water body (ID: GB530402609201) within and surrounding the Site is recorded as a heavily modified water body due to coastal protection use, flood protection use, and navigation use. The current (2019) overall status of this waterbody is 'moderate', with an ecological potential of 'moderate', and a chemical status of 'fail'.

5.13.2 Standard mitigation being considered includes following best practice guidance such as Pollution Prevention Guidance and application of environmental management best practice such as maintaining plant and providing spill kits to manage the risk of accidents and spillages/leaks during construction.

5.13.3 Taking into effect the mitigation measures detailed above, the preliminary assessment of impacts on marine water and sediment quality receptors is that the residual effects would be not significant with a medium level of confidence.

5.14 Water Quality, Coastal Protection, Flood Risk and Drainage

5.14.1 **Chapter 18: Water Quality, Coast Protection, Flood Risk and Drainage** characterises the baseline environment by identifying water bodies, source protection zones, Drinking Water Safeguard Zones (ground and surface water), drains and drainage, coastal protection, fluvial and tidal sources, reservoirs and groundwater and surface water flooding records in the vicinity of the Project. The following key water environment receptors have been identified in the vicinity of the Project:

a. The Humber Estuary (Humber Estuary TraC Operational Catchment) and in particular the Lower Humber (GB530402609201) which forms the eastern boundary of the Site boundary;

b. North Beck Drain, Middle Drain and Habrough Marsh Drain (a North East Lindsey internal drainage board watercourse skirts the southern and western perimeters of the port estate flowing from south to north) are all located in the vicinity of the Site boundary (part of Becks Northern Operational Catchment);

c. On-shore Water Framework Directive water bodies: North Beck Drain (GB104029067575) and North Lincolnshire Chalk Unit waterbody (GB40401G401500). The conditions of these waterbodies are Moderate ecological status and Poor overall status, respectively. These classifications by the Environment Agency are based on 'lowest' category, which for the surface water body is ecological status and for groundwater is around resources. A summary of WFD data for 2019 for North Beck Drain and North

Lincolnshire Chalk Unit waterbody are provided in **Table 18.5** of **Chapter 18: Water Quality** (PEI Report, Volume II); and

d. Various ecological sites:

   i Humber Estuary (Ramsar, SPA and Special Area of Conservation).

   ii On-shore limited conservation value apart from small patches of Priority Habitat (Coastal and Floodplain Grazing Marsh and Good quality semi-improved grassland: Non-Priority).

5.14.2 There are a number of large source protection zones (SPZ) local to the Project, including an SPZ1 (inner zone) lying very close to the edge of the Immingham Docks site. The other source protection zones are located west of the coastal strip (presumably designed to minimise saline intrusion).

5.14.3 Lying further to the west of the coast (west of A180) are various Drinking Water Safeguard Zones (Groundwater) associated with catchments of the source protection zones as described above. There are no Drinking Water Safeguard Zones (Surface Waters) in the vicinity of the Site.

5.14.4 These water environment constraints are being taken into account during the design of the Project, particularly with regard to the routeing of pipelines, the approach to the installation of any footings for above ground pipelines near to watercourses, and surface water drainage proposals. A Flood Risk Assessment is being undertaken and will be submitted with the DCO application. The Flood Risk Assessment will assess the flood risk both to and from the Project and demonstrate how flood risk would be managed over the Project's lifetime, giving due regard to climate change. Mitigation measures could include, but are not limited to, flood resistant and resilient design, appropriate finished floor levels and emergency evacuation.

5.14.5 In addition, a range of measures would be included in the Outline CEMP to protect the water environment during the construction phase such as:

a. Use of buffer strips between any drains/boundary of the Site and construction activity;

b. Bunding of assets that have a risk of causing contamination to surface waters and land by the spillage of hazardous liquids;

c. Spill kits placed in areas where there is a risk of spillages of hazardous liquids;

d. Avoiding construction activities when particularly wet conditions exist, which may cause surface runoff to be generated; or at a minimum putting in place enhanced monitoring at such times; and/or

e. Undertaking regular water quality monitoring be that by visual inspection or testing using hand-held probes.

5.14.6 Such measures would also be applicable to protect the water environment during the decommissioning of the hydrogen production facility.

5.14.7 The preliminary assessment has identified that construction, operation and decommissioning of the Project all have the potential to have adverse impacts and effects on both water quality and flood risk, but that with the implementation

of embedded and standard mitigation, residual effects are not likely to be significant.

5.15 Climate Change

5.15.1 **Chapter 19: Climate Change** presents the preliminary findings of (i) a lifecycle greenhouse gas impact assessment which considers the impact of greenhouse gas emissions arising from the Project on the climate; and (ii) a climate change resilience assessment which considers the resilience of the Project to climate change impacts, including how the design would consider projected impacts of climate change.

5.15.2 The Project is being designed, as far as possible, to avoid and minimise impacts and effects through the process of design development, and by embedding mitigation measures into the design. The Project itself is intended to support the UK's net zero ambitions through the provision of a terminal for import and export of energy products and the associated green hydrogen production facility.

5.15.3 As part of the lifecycle greenhouse gas assessment, the following additional mitigation measures are currently being considered, these include energy saving measures and the use of sustainable fuels.

5.15.4 As part of the climate change resilience assessment the following embedded mitigation measures are currently being considered:

a. Finished floor levels set in line with the Strategic Flood Risk Assessment at 300mm above the Critical Flood Level (i.e. above a level that doesn't result in additional loss of life or damage to property);

b. Flood resilient and resistant design measures; and

c. Ensuring the Site receives Environment Agency Flood Warning Service announcements.

5.15.5 Additional mitigation measures are being considered as part of the design development of the Project:

a. All new assets, structures and buildings will either be designed for projected climatic conditions e.g. increased average temperatures using appropriate design guidance where available, or adaptive capacity will be built into the designs;

b. Storm-proof infrastructure will be incorporated where possible (e.g., underground power supplies); and

c. Use of materials with superior properties which offer increased tolerance to high temperatures to be considered.

5.15.6 The main contractors' Environmental Management System will consider all measures deemed necessary and appropriate to manage severe weather events and should as a minimum cover training of personnel and prevention and monitoring arrangements. These would include:

a. Use of storm defences (e.g., walls, riprap);

b. Design site with refuges, storm-resilient materials and form; and

c. Ensure appropriate storage of plant and materials.

5.15.7 The preliminary lifecycle greenhouse gas assessment indicates that the significance of construction and operational phase greenhouse gas emissions would be minor adverse and therefore not significant. By way of wider context, one of the key drivers for the Project is to assist the UK in meeting its net zero targets through the production and distribution of green hydrogen to help decarbonise the transportation sector and to help facilitate the use of carbon capture and storage. As noted above, the Project is anticipated to produce up to 300MW of hydrogen per annum. Depending on market demand, it is estimated that this will meet up to 3% of Government's hydrogen production capacity target.

5.15.8 The preliminary climate change resilience assessment indicates that the construction and operation of the Project may be subject to adverse impacts from climate change unless appropriate measures are applied. A number of mitigation measures have been proposed in **Table 19.12** and **Table 19.13** of **Chapter 19: Climate Change** (PEI Report, Volume II) as part of the climate change resilience assessment. Incorporating these measures into the design of the Project will provide a level of resilience to climate change and reduce pre-mitigation moderate adverse effects down to low. The measures to be taken will be defined and confirmed in the ES.

5.16 Materials and Waste

5.16.1 **Chapter 20: Materials and Waste** presents a preliminary assessment of the likely effects of the Project on materials and waste. Materials are defined as "*physical resources that are used across the lifecycle of a development. Examples include key construction materials such as concrete, aggregate, asphalt and steel*" whereas waste is described as "*any substance or object which the holder discards or intends or is required to discard*".

5.16.2 A wide range of measures would be implemented during Project construction, operation and decommissioning to minimise and mitigate potential materials and waste impacts.

5.16.3 The Project would use the waste hierarchy and prioritise waste prevention, followed by re-use, recycling and recovery. Waste disposal to landfill would be minimised.

5.16.4 Measures to minimise materials and waste impacts will be defined in the Outline CEMP which will be submitted with the ES. In addition, an Outline Site Waste Management Plan (OSWMP) will be prepared and will accompany the DCO application. The contractor will prepare a Site Waste Management Plan (SWMP) before the commencement of construction, based upon the OSWMP. The OSWMP will set out the generic measures that would be implemented by the contractor to manage waste generated by the Project construction. To ensure suitable re-use of materials such as crushed concrete and soils, a Materials Management Plan (MMP) would be prepared and implemented for the Project that would detail measures to classify, track, store, dispose and potentially re-use excavated materials encountered.

5.16.5 An Outline DEMP including an estimate of the types and quantities of waste that would arise from decommissioning of the landside elements will be submitted

with the DCO application, a detailed DEMP would be prepared based upon the Outline DEMP.

5.16.6 Based on the current understanding of material and waste quantities associated with the Project, no significant effects are anticipated. Estimates of material and waste quantities will be further refined as the Project design progresses and the likely effects of the Project on materials and waste will be re-assessed and reported within the ES.

5.17 Ground Conditions and Land Quality

5.17.1 **Chapter 21: Ground Conditions and Land Quality** uses a wide range of data sources to establish baseline conditions at the Site and its surrounds. In order to further characterise site ground conditions, additional intrusive investigations at the Site are currently being undertaken which will inform the detailed design and which will support assessment. An Agricultural Land Classification survey will also be undertaken to confirm soil grades within the Site boundary.

5.17.2 The site of the green hydrogen production facility is within a Nitrate Vulnerable Zone associated with the North Beck Drain.

5.17.3 A wide range of mitigation measures as related to ground conditions and land quality would be implemented during the Project construction phase, including the following:

a. The Outline CEMP will detail measures to limit the dispersal and accidental release of soil derived dusts, uncontrolled run-off and accidental releases of potential contaminants. An Outline Remediation Strategy will be prepared to support the DCO application. The Outline Remediation Strategy will define the mitigation measures required for significant/unacceptable contamination risks and outline how the earthworks would be undertaken during construction; and

b. To ensure suitable re-use of materials such as crushed concrete and soils, the MMP (see above) would detail measures to classify, track, store, dispose and potentially re-use excavated materials encountered.

5.17.4 During Project operation, the hydrogen production facility would be regulated by the Environment Agency through an Environmental Permit. The facility would be operated in accordance with an operational Environmental Management Plan (EMP), which would detail the mitigation measures to minimise potential human health effects and effects upon the environment.

5.17.5 Based on the current understanding of the Site and the implementation of defined mitigation measures, the preliminary assessment indicates that Project construction, operational and decommissioning phases would result in neutral to slight adverse effects which are not significant.

5.18 Major Accidents and Disasters

5.18.1 **Chapter 22: Major Accidents and Disasters** presents a preliminary assessment which identifies and describes the potential, credible major accident and disaster (MA&D) scenarios which could be relevant to the Project.

5.18.2 The industrial area associated with the port of Immingham contains a number of existing upper tier Control of Major Accident Hazards (COMAH) sites which are regulated in accordance with the COMAH Regulations. The existing major accident hazard pipelines located in the study area are used to transport gas and petroleum products. In addition to the major accident hazard sites and pipelines, the baseline area consists of critical road, rail and seaport infrastructure and is an important industrial area within the UK.

5.18.3 A total of 15 potential hazardous scenarios have been identified and considered in the assessment. These Risk Events include incidents such as fire and/or explosion caused by a major loss of containment of flammable and toxic gases.

5.18.4 The potential consequences of scenarios identified are primarily harm caused to people present on-site. This could be as a result of any exposure to thermal radiation generated by fire, exposure to explosion overpressure, impact with objects and exposure to toxic ammonia gas. An application for hazardous substances consent is being submitted to North East Lincolnshire Council for consent. Through this process, HSE sets consultation distances, known as land use planning zones. The compatibility of the proposed hydrogen production facility and the existing uses within those zones will be considered. The Project consultation zones, if consent is given, are likely to impact the seven residential properties located on the west side of Queens Road which are therefore included within the Site boundary. Once the hydrogen production facility on the West Site is fully operational, it is likely that these properties will fall within or close to the Inner Zone associated with the operational Project. Further design work and consultation with the HSE are being undertaken relating to the consultation zones for the Project. It is currently anticipated that the continued residential use of those properties is unlikely to be compatible with the operation of the hydrogen production facility on the West Site and will need to cease. Discussions have commenced with the owners and occupiers with a view to negotiating their acquisition. Where it is not possible to acquire those properties through negotiation, acquisition powers for these properties will be sought through the DCO.

5.18.5 As defined in **Chapter 2: The Project,** a number of businesses are also present in the same area on the west side of Queens Road. It is likely that the ongoing operation of those businesses will be compatible with the operation of the hydrogen production facility. As part of HSE advice on the hazardous substance consent application, the HSE will determine if there are relevant impacts on these businesses. Whilst it is possible that powers to compulsorily acquire the properties or undertake appropriate works may be sought as part of the DCO, this is currently considered unlikely.

5.18.6 Where risks cannot be eliminated, they would be reduced to being ‘as low as reasonably practicable’ (ALARP). Residual risks associated with construction identified hazards would be managed via the CEMP, ensuring compliance with the Construction (Design and Management) (CDM) Regulations (Ref 22-8).

5.18.7 There are potentially harmful consequences to the environment as a result of the identified Risk Events. These include direct harm from thermal radiation to flora and fauna in and around the Humber Estuary caused by a major fire. A release of

harmful substances such as Marine Fuel Oil (MFO) from vessels transporting ammonia to Site could also cause harm.

5.18.8 The presence of toxic and flammable gases during Project operation means that their associated hazards cannot be entirely eliminated, but they must be managed to reduce risks to ALARP, in accordance with the Health and Safety Executive (HSE) requirements under the Control of Major Accident Hazards (COMAH) Regulations (COMAH) Regulations. Risk reduction and mitigation would be via compliance with all applicable UK legislation and the adoption of UK and worldwide industry standards and best practice used for the design of process equipment. In addition, the facilities would be subject to continuous monitoring, all personnel associated with the operation of the Project facilities would be subject to the highest standards of training and competency assurance, whilst applicable emergency plans would be prepared.

5.18.9 The hazards associated with activities undertaken during the decommissioning phase of the hydrogen production facility would be substantially the same as construction, however, as the process equipment and pipework would have contained dangerous substances, additional safety precautions would be required. Risks would be reduced to ALARP during decommissioning via appropriate controls, such as the use of equipment including electrical tools. These controls would be defined in the DEMP. Comprehensive plans for safety and environmental management during decommissioning would be developed prior to work commencing, to risk assess tasks and produce method statements for the work. This would be required as part of the COMAH Safety Report.

5.18.10 All risks during construction, operation and decommissioning have been reduced to ALARP.

5.18.11 The Project would comply with all relevant safety and environmental legislation for the management of risks on industrial facilities, from the design and construction phase, through operation and eventual decommissioning.

5.18.12 Further analysis of the level of potential harm to people and the environment, and more detailed information on the mitigation and control measures associated with the Project will be available as the design progresses and will be included within the ES.

5.18.13 The conclusions of the MA&D chapter are a qualitative assessment of the significance of identified foreseeable credible events and the residual risks after mitigation measures are taken into account. Risk management will be part of an ongoing process throughout the lifecycle of the Project and a requirement for compliance with applicable legislation including COMAH, Environmental Permitting, a Hazardous Substances Consent and Pipelines Safety Regulations (PSR).

5.19 Socio-Economics

5.19.1 **Chapter 23: Socio-economics** presents the preliminary findings of the assessment of the likely effects of the Project on socio-economic factors, including potential impacts on employment (including training and apprenticeship opportunities) and effects on the local community; users of recreational routes and Public Rights of Way and private assets (including residential properties,

development land, local businesses, community facilities, open space and visitor attractions relevant for tourism).

5.19.2 The Project is located within an area characterised as an industrial landscape type for the areas surrounding the Port. Beyond the industrial landscape, the wider area is largely agricultural. The Project is located near to Immingham, which lies approximately 1km west of the Site boundary, whilst Grimsby town centre is located approximately 5km to the south-east. The study area is mostly industrial and relatively sparsely populated with residential properties.

5.19.3 Within the North East Lincolnshire area, the population has reduced from 159,616 in 2011 to 156,900 in 2021 (or by 1.7%) (Ref 1-14). In 2020, the workforce of North East Lincolnshire comprised of approximately 66,000 employees.

5.19.4 There are two Public Rights of Way located within the boundary of the Site, Public Bridleway number 36 (part of England's Coast Path, connecting Laporte Road to Grimsby) and Public Footpath number 32 (connecting Queens Road to the Redwood Industrial Park).

5.19.5 During the construction and decommissioning phases, there may be temporary impacts on the use of the Bridleway which runs from Laporte Road to the Humber and would be either closed or diverted in these periods. Any temporary closure or diversion would be supported by an appropriate and clearly signed alternative route as relevant and these would be planned and programmed to minimise disruption to users. If the existing route is closed during these periods and no alternative provided, this would be considered to be a significant adverse effect.

5.19.6 Based on this preliminary assessment of socio-economic impacts, it is considered that there are likely to be residual significant effects associated with the construction period. These are construction employment generation (moderate beneficial), generation of gross value added (moderate beneficial), effects on identified residential properties (moderate adverse) and effects on businesses (moderate adverse). It is considered that there are no residual significant effects associated with the operational and decommissioning periods of the Project.

5.19.7 The final outcomes of the likely significant effects of the Project on Socio-economics will be reported within the ES.

5.20 Human Health and Wellbeing

5.20.1 **Chapter 24: Human Health and Wellbeing** draws upon the technical assessments included within the PEI Report to assess potential Project impacts on a range of human health and wellbeing determinants.

5.20.2 The baseline for the human health and wellbeing assessment considers the local wards in which the Project is located in or in close proximity to, compared where relevant to wider geographical areas of the Yorkshire and Humber Region, and England and Wales as a whole.

5.20.3 The total population of the study area, according to mid-year population estimates in 2020, is 42,470 (Ref 1-15). In 2020, the average proportion of

working age residents (aged 16 to 64) in the study area was 59.6% which is slightly lower than is typical for the Yorkshire and The Humber region (62.1%) and across England and Wales as a whole (62.2%).

5.20.4 The proportion of residents who self-identify as of White ethnicity within the study area (98.5%) is far greater than is typical for the Yorkshire and The Humber region (88.8%), and across England and Wales (86.0%) (Ref 1-16). Accordingly, the proportion of residents of other ethnic groups is below the equivalent regional and national rate.

5.20.5 North East Lincolnshire is the 66th most deprived local authority of 317 in England (where 1st is most deprived). North Lincolnshire is the 120th most deprived in England. West Lindsey is the 146th most deprived local authority in England (Ref 1-17).

5.20.6 The preliminary assessment has indicated that the Project has the potential to have positive and negative effects on human health and wellbeing determinants. It is possible that where positive or negative effects are reported this could ultimately result in a significant effect with respect to health and wellbeing, but this will depend on further assessment; the final outcome of which will be presented in the ES.

5.20.7 The Project has been designed, as far as possible, to avoid and minimise impacts and effects on health and wellbeing through the process of design development, and by embedding mitigation measures into the design. Relevant design, mitigation and enhancement measures have been recommended in the relevant related chapters (**Chapter 6: Air Quality, Chapter 7: Noise and Vibration, Chapter 11: Traffic and Transport, Chapter 19; Climate Change** and **Chapter 23: Socio-economics** of the PEI Report, Volume II) and are outlined above in this NTS including, for example, limits on noise emissions from plant and equipment at source and regular site inspections.

5.21 Cumulative and In-Combination Effects

5.21.1 **Chapter 25: Cumulative Effects and In-Combination Assessment** considers the following:

a. **In-combination or Combined effects**: effects that occur where a single receptor is affected by more than one impact from different aspects of the Project. An example of a combined effect could be where a local resident is affected by dust, noise and traffic disruption during the construction of the Project, with the result being a greater nuisance than each individual effect alone.

b. **Cumulative effects**: effects that occur as a result of a number of developments, which individually might not be significant, but when considered together could create a significant cumulative effect on a shared receptor when considered together with the Project.

5.21.2 The preliminary assessment indicates that there are a number of developments in the vicinity of the Project that need to be considered for their potential to generate cumulative effects. Of these developments, the one with the greatest potential to lead to significant cumulative effects is the Immingham Eastern Ro-

Ro Terminal (IERRT) development which comprises a new roll-on/roll-off terminal with a new jetty in the Port of Immingham.

5.21.3 Preliminary assessment indicates that there are not likely to be any significant cumulative effects in relation to IERRT when considered together with the Project (IGET), for the following topics: Nature Conservation (Terrestrial), Landscape and Visual, Historic Environment (terrestrial), Water Quality, Coastal Protection, Flood Risk and Drainage, Climate Change, Materials and Waste, Ground Conditions and Land Quality, Major Accidents and Disasters and Human Health and Wellbeing.

5.21.4 The preliminary assessment concludes that there is the *potential* for significant cumulative effects in relation to IERRT when considered together with the Project (IGET), for the following topics: Air Quality, Noise and Vibration, Natural Conservation (Marine Ecology), Ornithology, Traffic and Transport, Marine Traffic and Transport, Historic Environment (Marine), Physical Processes, Marine Water and Sediment Quality and Socio Economics. However, the mitigation measures employed, as necessary in respect of each project, will minimise the potential for adverse effects arising from each project alone in relation to these technical areas and this will then also minimise cumulative effects between the two projects through both construction and operation. Further details on mitigation measures to be deployed will be defined in the ES for the Project at which point the potential for cumulative effects will be assessed further and reported as necessary.

5.21.5 The potential for the IERRT development, and any other developments in the vicinity of the Project, to generate significant cumulative effects will be reported in greater detail in the ES. In the event that significant cumulative effects are identified, the ES will identify any additional mitigation measures that are required.

5.21.6 An initial assessment of in-combination effects is presented for receptors which could potentially be affected by more than one environmental topic in the form of a ‘Shared Receptor List’ which illustrates where there is the potential for overlap and in-combination effects across technical chapters for the Project. In-combination or combined effects have not been fully assessed at this stage and will be assessed within the ES.

6 Summary and Conclusions

6.1.1 The preliminary assessments summarised above indicate that the Project has the potential to generate some adverse environmental effects, a limited number of which have the potential to be significant after impact avoidance measures and mitigation is applied. These effects are outlined below in **Table 6.1**.

6.1.2 Following statutory consultation, the Applicant will consider any comments received in order to identify opportunities for the refinement of the Project design, and confirmation of mitigation approaches. The environmental effects associated with the resultant Project design will be assessed within the ES to be submitted with the DCO application.

Table 6.1: Summary Table of Significant Effects

Chapter	Project Stage	Effect
Chapter 7: Noise and Vibration	Construction	Construction noise from landside works for houses on Queens Road - potentially up to moderate/major (significant) effect
		Construction traffic noise for houses on Queens Road - minor/moderate adverse (potentially significant)
	Operation	On-site plant noise and operations for houses on Queens Road - up to moderate/major adverse (significant) (daytime and night-time)
		Project traffic on local roads for houses on Queens Road - minor/moderate adverse, (potentially significant)
Chapter 8: Nature Conservation (Terrestrial Ecology)	Construction	Pipeline construction resulting in loss of/damage to mature deciduous woodland habitat - moderate adverse (Significant)
Chapter 13: Landscape and Visual	Construction	Change in visual amenity for recreational users of public rights of way/bridleway and proposed English Coastal Path route - major adverse (significant)
		Change in visual amenity for motorised users and commercial receptors on Queens Road - moderate adverse (significant)
		Change in visual amenity for residential receptors on Queens Road - major adverse (significant)
	Operation	Change in visual amenity for recreational users of public rights of way/bridleway and proposed English Coastal Path route - moderate adverse (significant)
		Change in visual amenity for residential receptors on Queens Road - major adverse (significant)

Chapter	Project Stage	Effect
	Decommissioning	Change in visual amenity for motorised users and commercial receptors on Queens Road - moderate adverse (significant)
		Change in visual amenity for motorised users and commercial receptors on Queens Road - moderate adverse (significant)
		Change in visual amenity for residential receptors on Queens Road - major adverse (significant)
Chapter 23: Socio-Economics	Construction	Employment generation during the construction phase and Gross Value Added (GVA) generation during the construction phase – moderate beneficial (significant)
		Loss of residential properties on Queens Road and permanent displacement of businesses on Queens Road - moderate adverse (significant)

7 References

Ref 1-1 The Stationery Office Limited (2008). Planning Act 2008.

Ref 1-2 European Commission (1985). Council Directive of 27 June 1985 of the assessment of the effects of certain public and private projects on the environment (85/ 337/ EEC).

Ref 1-3 European Commission (2011). Directive 2011/ 92/ EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment.

Ref 1-4 European Commission (2014). Directive 2014/ 52/ EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/ 92/ EU on the assessment of the effects of certain public and private projects on the environment.

Ref 1-5 The Stationery Office Limited (2017). The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

Ref 1-6 Department for Transport (2012). The National Planning Policy Statement for Ports.

Ref 1-7 Department of Energy & Climate Change (2011). Overarching National Policy Statement for Energy (EN-1).

Ref 1-8 The Stationery Office Limited (2011). UK Marine Policy Statement.

Ref 1-9 Department for Business, Energy & Industrial Strategy (2021). Draft Overarching National Policy Statement for Energy (EN-1).

Ref 1-10 Ministry of Housing, Communities and Local Government (2021). National Planning Policy Framework.

Ref 1-11 North East Lincolnshire Council (2018). North East Lincolnshire Local Plan.

Ref 1-12 Maritime Management Organisation (2016). East Inshore and East Offshore Marine Plans.

Ref 1-13 British Standards Institute (BSI). (2019). BS 4142:2014+A1:2019: 'Methods for rating and assessing industrial and commercial sound'.

Ref 1-14 Office of National Statistics; Census 2021.

Ref 1-15 ONS, (2020); Mid-Year Population Estimates.

Ref 1-16 Office for National Statistics, (2020); Mid-Year Population Estimates

Ref 1-17 Ministry of Housing, Communities and Local Government (2019); English indices of deprivation 2019.

8 Abbreviations and Glossary of Terms

Table 8.1: Abbreviations and Glossary of Terms

Term	Acronym	Meaning
As Low As Reasonably Practicable	ALARP	ALARP is a principle in the regulation and management of safety-critical and safety-involved systems. The principle is that the residual risk shall be reduced as far as reasonably practicable.
Associated British Ports	ABP	One of the UK's leading and best-connected ports groups, owning and operating 21 ports and other transport-related businesses across England, Wales and Scotland.
British Standards Institution	BSI	A group which produces British Standards across industry sectors and which is formally designated as the National Standards Body for the UK.
Construction (Design and Management) 2015 Regulations	CDM	The Construction (Design and Management) 2015 Regulations aims to improve health and safety in the industry by helping to sensibly plan work so the risks involved are managed from start to finish.
Construction Environmental Management Plan	CEMP	A Construction Environmental Management Plan describes the specific mitigation measures to be followed by the appointed construction contractor to reduce potential nuisance impacts.
Control of Major Accidents and Hazards Regulations 2015	COMAH	The Control of Major Accidents and Hazards Regulations 2015 aims to prevent and mitigate the effects of major accidents involving dangerous substances which can cause serious damage/ harm to people and/ or the environment.
Decommissioning Environmental Management Plan	DEMP	A Decommissioning Environmental Management Plan describes the specific mitigation measures to be followed by the appointed construction contractor to reduce potential nuisance impacts during decommissioning.
Department for Environment, Foods and Rural Affairs	Defra	The Government department responsible for policy and regulations on environmental, food and rural issues. The department's priorities are to grow the rural economy, improve the environment and safeguard animal and plant health.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.

Term	Acronym	Meaning
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.
Environmental Management Plan	EMP	A document (or set of documents) that set out the mitigation needed to manage environmental effects associated with a project during its construction and operational phases.
Environmental Statement	ES	A statutory document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
European Economic Community	EEC	The European Economic Community (EEC) was a regional organisation created by the Treaty of Rome of 1957 to create a common market for its members through the elimination of most trade barriers.
Greenhouse gas	GHG	Atmospheric gases that absorb and emit infrared radiation emitted by the Earth's surface, the atmosphere and clouds.
Gross Value Added	GVA	A measure of the value of goods and services produced in an area, industry or sector of the economy.
Health and Safety Executive	HSE	The Health and Safety Executive is a UK government agency responsible for the encouragement, regulation and enforcement of workplace health, safety and welfare.
Immingham Eastern Ro-Ro Terminal	IERRT	The proposed ro-ro facility.
Immingham Green Energy Terminal	IGET	A multi-user liquid bulk jetty, located on the eastern side of the Port of Immingham,
Major Accidents and Disasters	MA&Ds	Major Accidents and Disasters was introduced into the EIA Regulations as a result of EU Directive 2014/ 52/ EU to assess potentially significant adverse effects of a development on the environment deriving from its vulnerability to risks of relevant major accidents and/ or disasters.
Marine Fuel Oil	MFO	A fraction obtained from the distillation of petroleum.
Materials Management Plan	MMP	A plan which sets out provisions for the reuse of excavated material resulting from the construction of the Project.
National Character Area	NCA	Areas of England defined by their unique combination of landscape, biodiversity, geodiversity, history and cultural an economic activity.

Term	Acronym	Meaning
Non-Technical Summary	NTS	This section of the Environmental Statement provides a summary of each document that makes up the Environmental Statement.
Noise Sensitive Receptor	NSR	Receptors which are potentially sensitive to noise. These comprise mainly residential buildings, but also include educational buildings, hospitals and places of worship.
Ordnance Survey	OS	The national mapping agency for the UK.
Outline Site Waste Management Plan	OSWMP	An outline plan to manage waste arising from the construction of the Project and which the SWMP will be based upon.
Pipeline Safety Regulations	PSR	The Pipelines Safety Regulations replace earlier prescriptive information on the management of pipelines safety with an more integrated, goal-setting, risk-based approach encompassing both onshore and offshore pipelines.
Preliminary Environmental Information	PEI	The information referred to in Part 1 of Schedule 4 of the EIA Regulations that has been reasonably compiled by the applicant and is reasonably required to assess the environmental effects of a project.
Preliminary Environmental Information Report	PEI Report	A report that compiles and presents the Preliminary Environmental Information gathered for a project.
Regional Character Area	RCA	Referred to within the regional character assessment by English Heritage and Lincolnshire County Council.
Royal National Lifeboat Institution	RNLI	The Royal National Lifeboat Institution is a charity that saves lives at sea through lifeboat search and rescue, lifeguards, water safety education and flood rescue.
Site of Special Scientific Interest	SSSI	Area of land notified by Natural England under section 28 of the Wildlife and Countryside Act 1981 as being of special interest due to its flora, fauna or geological or physiological features.
Site Waste Management Plan	SWMP	A management plan to manage site waste arising from the construction of the Project.
Special Protection Area	SPA	Sites designated under the European Directive on the Conservation of Wild Birds for the protection of birds in member states.
Transitional and Costal Waters	TraC	The transitional zone of water between river and sea.

Term	Acronym	Meaning
Water Framework Directive	WFD	A European Union Directive which commits member states to achieve good status of all waterbodies (both surface and groundwater), and also requires that no such waterbodies experience deterioration in status. Good status is a function of good ecological and good chemical status, defined by a number of elements.
Zone of Theoretical Visibility	ZTV	Map produced (usually digitally) to specific criteria to illustrate the area(s) from which a project can theoretically be visual.