KEEPING BRITAIN TRADING

IMMINGHAM EASTERN RO-RO TERMINAL

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Immingham Eastern Ro-Ro Terminal

Environmental Statement: Volume 1
Chapter 19: Climate Change

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19.1 Introduction

19.1.1 This chapter provides an environmental impact assessment (EIA) of the potential significant effects of the proposed Immingham Eastern Ro-Ro Terminal (IERRT) in relation to climate change. This chapter has been prepared by AECOM Ltd.

19.1.2 Consideration of any potential climate change effects of the IERRT project is divided into two aspects:

- Impact of the IERRT project on climate (greenhouse gas (GHG) emissions): considers the impact on the climate of GHG emissions arising from the IERRT project during its construction and operation (referred to in this chapter as 'lifecycle' GHG emissions), including how the IERRT project will affect the ability of the Government to meet its planned carbon reduction targets; and
- Climate change resilience (CCR) of the IERRT project to climate change: considers climate change risks, possible impacts to the IERRT project and embedded design and mitigation measures to mitigate these risks.

19.1.3 A standalone in-combination climate change impacts (ICCI) has been scoped out of the Climate Change assessment on the basis that any identified in-combination climate change impacts will be addressed in other relevant chapters of this environmental statement (ES) and supporting planning documents, namely the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11 of this ES).

GHG impact assessment

19.1.4 The global climate is the receptor for the lifecycle GHG impact assessment, with the UK Carbon Budgets being used as a proxy for the climate.

CCR review

19.1.5 The receptor for the review of climate change resilience is the IERRT project itself, including all infrastructure, assets, users of the IERRT project, and workers on-site during construction and operation.

19.2 Definition of the study area

GHG impact assessment

19.2.1 The boundary of the study area for the GHG assessment is based on where likely emissions will arise. This includes:

- GHG emissions arising from within the IERRT project site boundary including those occurring as a result of land clearance, construction, and operational activity; and
- GHG emissions occurring outside the IERRT project site boundary such as embodied carbon in materials, transportation, waste disposal and vessel emissions within UK waters and international shipping associated with the operation of the IERRT project.

19.2.2 Directly and indirectly, GHG emissions could compromise the UK's ability to reduce its GHG emissions, in line with international and national future carbon targets, as broadly identified by the climate science community and by the Paris Agreement, which aims to keep global temperature rise this century below two degrees above pre-industrial levels (United Nations Framework Convention on Climate Change (UNFCCC), 2016). A recent report by the Intergovernmental Panel on Climate Change (IPCC) highlighted the importance of limiting global warming below 1.5°C (IPCC, 2018).

19.2.3 The decommissioning phase has been scoped out the GHG assessment since it is expected the IERRT 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 (further detail can be found in Details of the Project Construction and Operation chapter (Chapter 3) of the ES). It is, therefore, highly unlikely that the IERRT infrastructure would be demolished after its design life as it will at that point, have become part of critical infrastructure, therefore, the development consent order (DCO) does not make provision for the decommissioning of the IERRT project.

19.2.4 Potential GHG emissions sources for the IERRT project lifecycle GHG impact assessment are summarised in Table 19.1.

Table 19.1. Potential GHG emissions sources considered for the lifecycle GHG impact assessment

Lifecycle Stage	Activity	Primary Emission Sources
Construction	Demolition	Emissions from plant and vehicles used during the demolition and any associated waste disposal
	Land Clearance	Land clearance is not expected to have a material impact on the overall emissions from the IERRT project as there is minimal natural vegetation to be removed
	Enabling works	Emissions associated with dredging activities
	Materials	Embodied carbon in materials
	Transport of Materials	Emissions from fuel combusted in vehicles/ plant
	Fuel use	GHG emissions from construction activities

Lifecycle Stage	Activity	Primary Emission Sources
	Commuting	GHG emissions arising from the fuel used by vehicles transporting workers to the construction site
	Waste	Emissions arising from the treatment of waste
	Transport of waste	Emissions arising from the transportation of the waste to the place of treatment
Operation	Commuting	GHG emissions arising from the fuel used by vehicles transporting workers to and from the operational site
	Fuel use	GHG emissions from grid electricity use during operation GHG emissions from fuel consumed from plant use
	Water & Wastewater	GHG emissions from the provision and treatment of water
	Vessels	Emissions associated with the vessels using the IERRT project
	Maintenance	Emissions from maintenance dredging activities
	Freight Transportation	Emissions from vehicles associated with the operational phase of the IERRT project
	Waste	Emissions arising from the treatment of waste
	Waste Transportation	Emissions arising from the transportation of the waste to the place of treatment

CCR review

19.2.5 The IERRT project's resilience to climate change is considered within the IERRT project site across the timeframe of the IERRT project (from construction through to operation).

19.2.6 The climate's direct effects include damage to assets as a result of projected climate change, and the associated costs in terms of loss of time, loss of function, repairs, etc.

19.2.7 Potential indirect effects include climate change impacts to supply chains, potable water supply and third-party energy providers, which may impact the IERRT project resulting in operational downtime and associated monetary loss.

19.2.8 The summary of climate parameters assessed in the CCR review is detailed in Table 19.2.

Table 19.2. Climatic parameters considered for the CCR review

Climatic Parameter	In Scope of the CCR Review?	Rationale for Inclusion
Extreme weather events	Yes	The IERRT project may be vulnerable to extreme weather events such as storm damage to structures and assets.
Temperature	Yes	Increased temperatures may increase the cooling requirements associated with the buildings of the IERRT project and could impact the structural integrity of infrastructure and affect safe working conditions for site workers.
Sea-level rise	Yes	The IERRT project could be vulnerable to sea-level rise, causing damage to assets and infrastructure.
Precipitation	Yes	The IERRT project may be vulnerable to changes in precipitation, for example, pressure on water supply during periods of reduced rainfall and damage to structures and drainage systems during periods of heavy precipitation.

19.3 Assessment methodology

Data and information sources

19.3.1 A desk-based review of available information has determined current baseline conditions. A project-specific survey was not necessary to be undertaken for the climate assessment

19.3.2 The main desk-based sources of information that have been reviewed to inform the current baseline description within the vicinity of the IERRT project include:

- Historical climate data obtained from the Met Office (Met Office, 2021);
- UK Climate Projections 2018 (UKCP18) (Met Office, 2018a);
- Clean Maritime Plan (Department for Transport (DfT), 2019); and
- Associated British Ports (ABP) Climate Change Adaptation Report (ABP, 2016)

Determining significance of effects

GHG impact assessment

19.3.3 The GHG emissions have been calculated in line with Publicly Available Specification (PAS) 2080 (British Standards Institute (BSI), 2016) and the GHG protocol methodology, which is consistent with guidance from a range of sources, including Institute of Environmental Management and

Assessment (IEMA) guidance (IEMA, 2022)[1], World Business Council for Sustainable Development (WBCSD) and World Resources Institute (WRI) GHG Protocol guidelines (WBCSD/ WRI, 2013).

19.3.4 The GHG impact assessment has taken a project lifecycle approach to identify GHG emissions hotspots (i.e., emissions sources likely to generate the largest amount of GHG emissions) and correspondingly enable the identification of priority areas for mitigation. This approach is consistent with the principles set out in IEMA guidance (IEMA, 2022).

19.3.5 In line with the WBCSD and WRI GHG Protocol guidelines (WBCSD/ WRI, 2013), the lifecycle GHG impact assessment is reported as tonnes of carbon dioxide equivalent (tCO_2e). For this reason, the shorthand 'carbon' may be generically used to refer to GHG emissions and considers the seven Kyoto Protocol gases, namely:

- Carbon dioxide (CO_2);
- Methane (CH_4);
- Nitrous oxide (N_2O);
- Sulphur hexafluoride (SF_6);
- Hydrofluorocarbons (HFCs);
- Perfluorocarbons (PFCs); and
- Nitrogen Trifluoride (NF_3).

19.3.6 IEMA (2022) recommends that local, sectoral, or national carbon budgets are used to contextualise emissions. The GHG emissions have been contextualised against the UK carbon budgets and the Green Construction Board's Embodied Carbon for infrastructure budget. Local carbon budgets were not used in this assessment as they were not seen as appropriate for contextualising emissions from the IERRT project since it is classified as nationally significant infrastructure project where emission sources are on a predominantly non-localised scale.

19.3.7 Table 19.3 of this chapter shows the currently legislated carbon budgets including the 6th carbon budget from 2033 to 2037, the first to align with the UK's net zero target (UK Government, 2021). The magnitude of GHG emissions from the IERRT project on the global climate has been put into context in terms of the contribution to these budgets and whether they will impact these budgets being met.

[1] In the absence of any widely accepted guidance on assessing the significance of the impact effect of GHG emissions, the 2nd Edition of the EIA Guidance published by IEMA in February 2022 will be followed. This provides a framework for the consideration of GHG emissions in the EIA process, in line with the 2014 European Union (EU) Directive.

Table 19.3. Relevant carbon budgets (UK Government, 2021).

Carbon Budget	National Carbon Budget ($MtCO_2e$)
3rd (2018-2022)	2,544
4th (2023-2027)	1,950
5th (2028-2032)	1,725
6th (2033-2037)	965

19.3.8 There is currently no published standard definition for receptor sensitivity of GHG emissions. All GHG emissions are classed as being capable of being significant on the basis that all emissions contribute to climate change (IEMA, 2022). The global climate has been identified as the receptor for the purposes of the GHG assessment. The sensitivity of the climate to GHG emissions is considered to be 'high'. The rationale supporting this includes:

- GHG emission impacts could compromise the UK's ability to reduce its GHG emissions, in line with international and national future carbon targets; and
- The need to reduce GHG emissions to reduce the risks and impacts of climate change, as broadly identified by the climate science community and the Paris Agreement which aims to keep global temperature rise this century below two degrees above pre-industrial levels. Additionally, reports by the IPCC (IPCC, 2018) have highlighted the importance of limiting global warming below 1.5°C.

19.3.9 The level of significance of total project-related emissions has been determined using IEMA's (2022) significance criteria which are not solely based on whether a development emits GHG emissions alone, but how it makes a relative contribution towards achieving a science based 1.5°C aligned transition towards net zero. The definitions for IEMA's levels of significance are provided in Table 19.4.

Table 19.4. Significance criteria for the GHG emissions impact assessment (IEMA, 2022)

Effects	Significance level	Description
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 trajectory or accepted aligned practice or area-based transition targets.
	Moderate adverse	
Not significant	Minor adverse	A project that is compatible with the budgeted, science based 1.5°C trajectory (in terms of rate of emissions

Effects	Significance level	Description
		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% reduction against a 1990 baseline 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. The project is playing a part in achieving the rate of transition required by nationally set policy commitments.
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.

19.3.10 The IEMA (2022) guidance states that an exception to the above significance criteria should be made for large-scale developments that might materially affect the UK or devolved administration carbon budget. In this instance IEMA propose that an indicative threshold of 5% of the UK's budget is used at which the magnitude of GHG emissions is significant, irrespective of any reductions.

19.3.11 As the IERRT project is classified as a nationally significant infrastructure project it has been deemed appropriate to use the indicative 5% significance threshold over the relevant time periods to measure the scheme's impact. Following the IEMA (2022) guidance, the magnitude of emissions over the 5% significance threshold of the UK carbon budgets is likely to be considered significant. However, the significance of emissions will be determined in line with the criteria defined in Table 19.4 of this chapter.

19.3.12 To provide further context on the magnitude of IERRT project emissions construction emissions from the project have been compared to the Green Construction Board (GCB) Net Zero Whole Life Carbon Roadmap (2021). The GCB Net Zero Whole Life Carbon Roadmap for the Built Environment serves as a visual tool enabling stakeholders to understand the policies, actions and key decision points required to help the construction sector contribute towards the UK achieving a transition towards a net zero carbon economy by 2050.

19.3.13 Therefore, to contextualise the IERRT project's construction impact on the UK's transition towards a low carbon economy, the GCB's sectoral commercial carbon budget was used as a comparison against the IERRT project's material embodied carbon.

Table 19.5. The Green Construction Board's commercial carbon budgets

Period	Commercial ($MtCO_2e$)
2024	6.6
2025	7.1

CCR Review

19.3.14 The CCR review has qualitatively reviewed the IERRT project's resilience (including the proposed design mitigation measures) to climate change. This has been completed in liaison with the project design team and other EIA technical disciplines, considering the UKCP18 (Met Office, 2018a) projections for the geographical location and timeframe of the IERRT project (from construction (including pre-construction) and operation.

19.3.15 The following key terms and definitions relating to the CCR review have been used:

- 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;
- 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
- Consequence – any effect on the receptor or asset resulting from the climate hazard having an impact.

19.3.16 The criteria which have been used to determine the likelihood of a climate change hazard occurring are detailed in Table 19.6 below. The event is defined as the climate event (such as heatwave), while the hazard is defined as an impact on the proposed development caused by the climate event (such as overheated electrical equipment).

Table 19.6. Categories 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 high and impact occurs often or the likelihood of climate hazard occurring is moderate and impact is likely to occur always/ almost always.
Low	Likelihood of climate hazard occurring is high but impact rarely occurs or the likelihood of climate hazard occurring is moderate and impact sometimes occurs or the likelihood of climate hazard occurring is low and impact is likely to occur always/ almost always.
Negligible	All other eventualities - highly unlikely but theoretically possible.

Table 19.7. 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.

19.3.17 Following identification of climate hazards, the likelihood of climate change impacts and consequences have been assessed according to Table 19.6 and Table 19.7 of this chapter respectively. The categories and descriptions provided in Table 19.8 of this chapter below are based on the IEMA (2020) climate change resilience and adaptation guidance.

19.3.18 The ES presents embedded mitigation measures present in the design of the IERRT project (based on those identified by each technical discipline) to demonstrate how the IERRT project will be adapted to increase its resilience to future climate conditions.

19.3.19 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 19.8 to this chapter. The assessment has taken into account confirmed design and mitigation measures (referred to as embedded mitigation).

Table 19.8. Significance of effect matrix (where 'S' is significant and 'NS' is not significant)

Measure of Consequence	Likelihood of Climate-Related Impact Occurring			
	Negligible	**Low**	**Moderate**	**High**
Negligible	NS	NS	NS	NS
Low	NS	NS	NS	S
Moderate	NS	NS	S	S
High	NS	S	S	S

19.4 Consultation

19.4.1 Consultation as to whether there are likely to be any climate change effects as a result of the construction and operation phases of the IERRT project has been undertaken with key stakeholders and members of the public. The outcomes of the formal scoping process, as well as any relevant feedback received in response to the statutory consultation and the publication of the Preliminary Environmental Information Report (PEIR) and supplementary statutory consultation and the publication of the Supplementary Consultation Report, have also been taken into account to inform the assessment.

19.4.2 The outcome of the consultation that has been undertaken along with how it has influenced the Climate Change assessment, is summarised in Table 19.9.

Table 19.9. Summary of consultation

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
Planning Inspectorate (PINS)	Scoping Opinion, October 2021 Table ID 4.15.1	The Inspectorate agrees that greenhouse gas (GHG) emissions from pre-construction activities can be scoped out of further assessment; if the situation changes or if the development consent order (DCO) would allow pre-construction activities, then the ES should include the emissions from these activities.	Emissions from pre-demolition works are scoped into the assessment in this chapter (under the construction phase) to present a worst-case scenario – see Table 19.1 of this ES chapter.
PINS	Scoping Opinion, October 2021 Table ID 4.15.2	The ES should include an assessment of GHG emissions from maintenance works or further justification that the works are likely to give rise to minimal GHG emissions.	GHG emissions from construction and operation – including maintenance activity - have been scoped into the assessment in this chapter – see Table 19.1 of this ES chapter.
PINS	Scoping Opinion, October 2021 Table ID 4.15.3	It is not clear to the Inspectorate if the IERRT project would have a fixed life and would be decommissioned at the end of its life. If the DCO makes provision for the decommissioning of the IERRT project then the ES should provide an assessment of the associated GHG emissions.	The decommissioning phase has been scoped out the GHG assessment since it is expected that the IERRT project will continue to be maintained so that it can be used for port related activities to meet a long-term need and, will become part of critical infrastructure, therefore, the DCO does not make provision for the decommissioning of the IERRT project.

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
PINS	Scoping Opinion, October 2021 Table ID 4.15.4	In light of the duration of operation and predicted increases in future storm frequency, intensity and precipitation, the Inspectorate considers that impacts of precipitation and wind should be addressed in the ES.	Precipitation has been addressed in this ES and is scoped into the CCR review – see Table 19.2 of this ES chapter. In the UKCP18 Wind Factsheet, the Met Office states (Met Office, 2020): "*There are no compelling trends in storminess, as determined by maximum gust speeds, from the UK wind network over the last four decades*." and "*Wind speed is not available for the probabilistic projections as they did not pass our credibility checks*." While reference could be made to the winter wind speed anomaly data from the 12 km land projections dataset, the climate models do not show any clear trends. Due to this uncertainty, projected wind speed cannot be addressed in the ES.
PINS	Scoping Opinion, October 2021 Table ID 4.15.5	The ES should include an assessment of exclusion of temperature and wind parameters from the in-combination climate change impact (ICCI) assessment, or the information referred to demonstrating agreement with the relevant consultation bodies and the absence of a likely significant effect.	Temperature has been scoped into the ES as part of the CCR review – see Table 19.2 of this ES chapter. As noted in the row above the Met Office (2020) states: "*There are no compelling trends in storminess, as determined by maximum gust speeds, from the UK wind network over the*

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
			last four decades." and "*Wind speed is not available for the probabilistic projections as they did not pass our credibility checks*." Therefore, as the climate models do not show any clear trends, projected wind speed cannot be addressed in the ES.
PINS	Scoping Opinion, October 2021 Table ID 4.15.6	The Scoping Report states that ICCI assessment has been scoped out of the climate change chapter on the grounds that any identified ICCIs would be addressed in the coastal protection, flood defence and drainage chapter. The Inspectorate agrees with this approach but advises that the other relevant sections of the ES should be signposted in this chapter.	ICCI has been scoped out of the ES – as explained in Section 19.1 of this chapter. Each of the climate parameters relevant to ICCI has been assessed through other disciplines (Physical Processes in Chapter 7 of this ES and Coastal Protection, Flood Defence and Drainage in Chapter 11 of this ES), with any risks identified and mitigated within these other assessments.
PINS	Scoping Opinion, October 2021 Table ID 4.15.7	The ES should consider emissions from Heavy Goods Vehicle (HGV) or rail movements to and from the IERRT project site or provide a justification as to why a likely significant effect would not arise. The Inspectorate recognises that definition of the study area may be problematic but suggests that the assessment should consider the number of new or lengthened	HGV have been considered as freight transport in this ES and assessed in Section 19.8 of this ES chapter. The IERRT project will not generate rail movements.

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
		movements on the road and rail networks which can be attributed to the IERRT project.	
Natural England	Appendix 2 Natural England response	The England Biodiversity Strategy published by Defra establishes principles for the consideration of biodiversity and the effects of climate change. The ES should reflect these principles and identify how the development's effects on the natural environment will be influenced by climate change, and how ecological networks will be maintained. The National Planning Policy Framework (NPPF) requires that the planning system should contribute to the enhancement of the natural environment '*by establishing coherent ecological networks that are more resilient to current and future pressures*' (NPPF Para 174), which should be demonstrated through the ES.	Numerous marine habitat and waterbird surveys and a Phase I Habitat survey of the IERRT project site have been undertaken. Ecological habitats within the landside extent of the site are limited due to the existing operational nature of the site. Further details are provided in the Nature Conservation And Marine Ecology chapter (Chapter 9 of this ES) and in the Preliminary Ecological Appraisal at Appendix 6.2 in Volume 3 of this ES (Application Document Reference number 8.4).
North Lincolnshire Council (PI38)	Statutory Consultation - 19 January – 23 February 2022	It is noted that the proposal will likely increase GHG emissions however this chapter concludes that the potential impact in relation to climate hazards is low. Having considered this, North Lincolnshire Council (NLC) does not have any objections to the approach set out in the PEIR.	Noted. The approach set out in the PEIR has been implemented in this ES.

Consultee	Reference, Date	Summary of Response	How Comments have been Addressed in this Chapter
CLdN (C.RO) (PI41)	Statutory Consultation - 19 January – 23 February 2022	Concerns around the quantification of GHG from the highway network.	The ES has assessed the significance of terrestrial transport emissions produced from the IERRT project. Confirmed risks associated with GHG emissions are set out in the GHG assessment in Section 19.8 of this ES chapter.
Q37	Statutory Consultation - 19 January – 23 February 2022	Concerns raised regarding the climate crisis and that the facility should be rail served with road usage kept to a minimum.	The ES has assessed the significance of terrestrial transport emissions produced from the IERRT project. Confirmed risks associated with GHG emissions are set out in the GHG assessment in Section 19.8 of this ES chapter.
Q26, Q35, Q70	Statutory Consultation 19 January – 23 February 2022	Concern about the increased levels of pollution, specifically noise and carbon emissions caused by additional vessels and HGV's both within the terminal and the surrounding area.	Confirmed risks associated with GHG emissions are set out in the GHG assessment in Section 19.8 of this ES chapter.
Q26, Q35,	Statutory Consultation 19 January – 23 February 2022	Suggest that more mitigation is needed to address impacts of pollution, including a long-term plan to offset the emissions.	The ES has evaluated the significance of GHG emissions from the IERRT project and mitigation measures have been considered in this ES, detailed in Section 19.9 of this ES chapter.
All	Supplementary Statutory Consultation – 28 Oct – 27 Nov 2022	No comments were received with respect to climate change in response to the supplementary statutory consultation exercise.	N/A

19.5 Implications of policy legislation and guidance

19.5.1 This section of the chapter sets out key aspects and implications of policy and guidance relevant to the assessment of likely impacts on the climate. It builds upon the overarching chapter covering the Legislation, Policy and Consenting Framework (Chapter 5) of this ES.

International legislation

United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement

19.5.2 The Paris Agreement is a legally binding agreement within the UNFCCC dealing with GHG emissions mitigation, adaptation and finance starting in the year 2020. It requires all signatories to strengthen their climate change mitigation efforts to keep global warming to well below 2°C this century and to pursue efforts to limit global warming to 1.5°C (UNFCCC, 2016).

UK legislation and regulation

EIA regulations

19.5.3 The Environmental Impact Assessment (EIA) Directive (2011/92/EU) (as amended) is implemented in England, Wales and for limited purposes in Scotland in the context of the nationally significant infrastructure regime under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended). Both the Directive and the Regulations include a requirement to describe the likely significant effects resulting from the impact of the IERRT project on climate change and resulting from the vulnerability of the IERRT project to climate change (EIA Regulations, Schedule 4(5)).

Climate Change Act 2008

19.5.4 The Climate Change Act 2008 sets a target for the year 2050 for the reduction of targeted greenhouse gas emissions using a carbon budgeting system established by the Committee on Climate Change. In June 2019, the Climate Change Act 2008 was amended pursuant to the Climate Change Act 2008 (2050 Target Amendment) Order 2019, requiring the government to reduce the UK's GHG emissions to net zero by 2050 (UK Government, 2021).

19.5.5 The sixth Carbon Budget, the first to align with the amended carbon reduction target, was published by the Climate Change Committee for consideration by the government in November 2020. In April 2021, the government accepted the Climate Change Committee's 965 $MtCO_2e$ recommendation and laid the Carbon Budget Order 2021 before parliament. The new target was enshrined in law at the end of June 2021 and will

incorporate the UK's share of international aviation and shipping emissions (Committee on Climate Change, 2020).

National policy

The National Policy Statement for Ports (NPSfP)

19.5.6 The National Policy Statement for Ports (NPSfP) (DfT, 2012) is one of a number of national policy statements established under the 2008 Act to deal with different nationally significant infrastructure projects. It provides the framework for decisions on proposals for harbour facility nationally significant infrastructure projects. Paragraph 3.3.3 the NPSfP sets out that:

- "*in order to help meet the requirements of the Government's policies on sustainable development, new port infrastructure should also:*
- *...minimise emissions of greenhouse gases from port related development and be adapted to the impacts of climate change...*" (DfT, 2012).

19.5.7 Section 4.12 provides further information on climate change mitigation. In paragraph 4.12.1 the NPSfP sets out that:

> "*Port developments may have an effect on greenhouse gases, particularly through their impact on sea and road transport. This impact may be positive, if the development results in transmodal shifts from road to shipping (including coastal shipping) or to rail transport, and the benefits from these shifts are greater than any additional emissions that may be associated with the proposed development*."

19.5.8 Section 4.13 covers climate change adaptation which sets out in paragraph 4.13.2:

> "*Section 4.12 of this NPS covers climate change mitigation. While climate change mitigation is essential to minimise the most dangerous impacts of climate change, previous global greenhouse gas emissions have already committed us to some degrees of continued climate change for at least the next 30 years*."

National Planning Policy Framework (NPPF)

19.5.9 Whilst not containing specific policies for nationally significant infrastructure projects (NSIPs), the National Planning Policy Framework (NPPF) (Ministry for Housing, Communities and Local Government (MHCLG) 2021), which sets out the Government's planning policies for England, can be a matter of relevance in the determination of an NSIP.

19.5.10 Policies of relevance to climate change and sustainability assessment within the NPPF include those relating to achieving sustainable development and meeting the challenge of climate change, flooding and coastal change. Paragraph 152-153 of the NPPF states that:

> *"The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure…*
> *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, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure."*
> (MHCLG, 2021).

19.5.11 Paragraph 170 of the NPPF states that:

> "*In coastal areas, planning policies and decisions should take account of the UK Marine Policy Statement and marine plans. Integrated Coastal Zone Management should be pursued across local authority and land/sea boundaries, to ensure effective alignment of the terrestrial and marine planning regimes*." (MHCLG, 2021).

Transport Decarbonisation Plan, Decarbonising Transport: a better, greener Britain and the Clean Maritime Plan

19.5.12 The Transport Decarbonisation Plan (DfT, 2021) sets out the Government's commitments and actions needed to decarbonise the transport system in the UK before 2050. The Plan expands the Government's commitments to reduce and remove fossil fuels from road transport and sets phase-out dates for every type of new fossil-fuelled road vehicle, including maritime vehicles.

19.5.13 The Plan proposes to plot a course to net zero for the UK domestic maritime sector, with indicative targets from 2030. It also refers to a planned review and refresh in 2022 of the Clean Maritime Plan (DfT, 2019). Additionally, the Clean Maritime Plan strives for the UK to take a proactive role and act as an international leader to influence the transition of global international shipping standards towards net-zero (DfT, 2019).

Local policy

North East Lincolnshire Local Plan

19.5.14 The North East Lincolnshire Local Plan, adopted in 2018 (North East Lincolnshire Council, 2018), provides a spatial vision for North East Lincolnshire with strategic objectives and a development strategy.

19.5.15 Strategic Objective SO2 Climate Change of the North East Lincolnshire Local Plan seeks to:

> *"Address the causes and effects of climate change by promoting development that minimises natural resources and energy use; reduces waste and encourage recycling; reduces pollution; brings about opportunities for sustainable transport use; responds to increasing flood risk; and, incorporates sustainable construction practices. Promote appropriate distribution of development and the role of green infrastructure in mitigating aspects of flood risk. Recognise the increased stress on habitats and species that climate change causes."* The relevant climate change critical success factors set out within the Strategic Objective comprise:
>
> - '*Reduced the waste generated and increased waste recycling*';
> - '*Addressed the issue of poor air quality*'; and
> - '*Increased usage of sustainable transport modes'*."

19.6 Description of the existing environment

GHG emissions

19.6.1 For the purpose of the assessment of the GHG emissions, the current baseline is a 'business as usual' scenario where the IERRT project does not go ahead. It is anticipated that there might be some residual baseline emissions from freight transport and vessels in the local area. However, these are not possible to quantify so as a 'worst-case scenario' the baseline will be considered zero.

CCR

19.6.2 The existing baseline for the CCR review is based upon historical climate data obtained from the Met Office recorded by the closest meteorological station to the IERRT project (which is located at Cleethorpes; 8 miles south-east from the IERRT project) for the period 1981-2010 (see Table 19.10 below).

Table 19.10. Historical climate data for climate station: Cleethorpes, 1981-2010 (Met Office, 2021)

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

19.7 Future baseline environment

GHG emissions

19.7.1 For the purpose of the assessment of the GHG emissions, the future baseline is a 'business as usual' scenario where the IERRT project does not go ahead. It is anticipated that there might be some residual baseline emissions from freight transport and vessels in the local area. However, these are not possible to quantify so as a 'worst-case scenario' the baseline will be considered zero.

19.7.2 Based on the existing use of the IERRT project site future GHG emissions would come from the following sources:

- Fuel use;
- Freight transport;
- Maintenance activities;
- Shipping;
- Waste generation;
- Waste treatment (including water and drainage/ run off); and
- Worker transport/ employee commuting.

CCR

19.7.3 UKCP18 provides probabilistic climate change projections for pre-defined 30-year periods for annual, seasonal and monthly changes to mean climatic conditions over land areas. The future baseline is expected to differ from the present-day baseline described above. For the purpose of the assessment, UKCP18 probabilistic projections for pre-defined 30-year periods for the following average climate variables were obtained and have been further analysed:

- Mean winter temperature;
- Maximum summer temperature;
- Minimum winter temperature;
- Annual precipitation change (%);
- Summer precipitation change (%);
- Winter precipitation change (%);
- Extreme weather events; and
- Sea level rise.

19.7.4 UKCP18 probabilistic projections for precipitation have been taken into account as part of the climate change allowances within the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11) of this ES.

19.7.5 Projected temperature and precipitation variables are presented in Table 19.11 and Table 19.12 to this ES chapter, respectively. UKCP18 probabilistic projections have been analysed for the 25 km² grid square within which the IERRT site is located. These figures are expressed as temperature and precipitation anomalies in relation to the 1981-2010 baseline data.

19.7.6 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, which represents a high emissions scenario.

19.7.7 The CCR assessment has considered a scenario that reflects a high level of GHG emissions at the 10%, 50% and 90% probability levels up to the 2089 (2060 to 2089, as defined by UKCP18) to assess the impact of climate change over an engineering design standard of 50 years as aligned BS EN 1990 Eurocodes (BS, 2002).

Table 19.11. Projected changes in temperature variables (°C)

Climatic Variable	Time Period	
	2020-2049	2060-2089
Mean annual air temperature anomaly at 1.5 m (°C)	+1.0 (+0.4 to +1.7)	+2.8 (+1.4 to +4.3)
Mean summer air temperature anomaly at 1.5 m (°C)	+1.2 (+0.5 to +2.0)	+3.4 (+1.4 to +5.5)
Mean winter air temperature anomaly at 1.5 m (°C)	+0.9 (+0.0 to +2.0)	+2.5 (+0.8 to +4.2)
Maximum summer air temperature anomaly at 1.5 m (°C)	+1.3 (+0.4 to +2.3)	+3.0 (+1.4 to +4.6)
Minimum winter air temperature anomaly at 1.5 m (°C)	+0.9 (-0.1 to +2.0)	+2.5 (+0.7 to +4.4)

Table 19.12. Projected changes in precipitation (%)

Climatic Variable	Time Period	
	2020-2049	2060-2089
Annual precipitation rate anomaly (%)	+0.9 (-3.6 to +5.3)	0.0 (-5.3 to +5.3)
Summer precipitation rate anomaly (%)	-8.1 (-24.2 to +7.7)	-22.9 (-47.8 to +2.5)
Winter precipitation rate anomaly (%)	+4.2 (-3.9 to +12.7)	+14.3 (-1.6 to +31.4)

19.7.8 Using the latest UKCP18 relative sea-level research and assuming an RCP8.5 95% percentile scenario, the sea level is projected to increase by 0.52 m by 2089 (Met Office, 2018a). Projected increases in sea level rise are taken into account as part of the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11) of this ES.

19.7.9 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 any changes (Met Office, 2018b). Under these assumptions, it is considered that extreme weather will

become more frequent. Projected increases in the frequency of extreme weather events are taken into account as part of the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11) of this ES.

19.7.10 Wind was scoped out of the assessment. In the UKCP18 Wind Factsheet (Met Office, 2020), the Met Office states: "*There are no compelling trends in storminess, as determined by maximum gust speeds, from the UK wind network over the last four decades*." and "*Wind speed is not available for the probabilistic projections as they did not pass our credibility checks*." While reference could be made to the winter wind speed anomaly data from the 12 km land projections dataset, the climate models do not show any clear trends.

19.7.11 UKCP18 predicts the UK can expect an increase in the frequency and severity of long-term droughts, with droughts at least as severe as seen in 2010 with the number of droughts increasing by 146%, at a 4.0°C level of global warming

19.8 Consideration of likely impacts and effects

19.8.1 This section of the Climate Change chapter is structured to consider the GHG impacts from construction and operational phases of the IERRT project first, and then present the findings of the CCR review for construction and operational phases.

Cumulative GHG impact assessment

19.8.2 This section identifies the potential likely effects on the GHG receptor as a result of the construction and operation of the IERRT project.

19.8.3 The Air Quality assessment (Chapter 13) of this ES has informed the terrestrial transport and localised vessel carbon emissions used in this assessment.

19.8.4 The GHG assessment provided is an inherently cumulative assessment. The concentration of GHG's and their effect on the climate is affected by all sources and sinks globally. The impacts and effects of GHG emissions are therefore global not local. The approach to intra project cumulative effects therefore differs for the GHG assessment compared to other EIA topics as all global cumulative GHG sources are relevant to the effect on climate change. There is no basis for selecting any particular cumulative project over any for the GHG assessment (as explained in Chapter 20 of the ES).

Construction phase

19.8.5 This section contains an assessment of the potential impacts to the GHG receptor as a result of the construction phase of the IERRT project. Construction emissions were calculated in line with PAS2080 and the GHG protocol methodology across the following GHG emission sources:

- Demolition waste;
- Commuting/ worker transport (enabling);
- Fuel use on-site (enabling);
- Materials;
- Transport of materials;
- Construction activities;
- Dredging;
- Transport of waste; and
- Waste emissions arising from the treatment of waste.

19.8.6 The greatest GHG impact during the construction phase is as a result of embodied carbon within the construction materials.

19.8.7 Other sources of emissions during construction within the scope of the assessment of the GHG emissions include materials, enabling works waste, worker transport, fuel use, transport of materials, construction activities, dredging and waste emissions.

19.8.8 Total GHG emissions from the construction phase are estimated to equate to around 72,019 tCO_2e. A breakdown of estimated GHG emissions from the construction of the IERRT project is presented in Table 19.13 to this chapter.

19.8.9 The construction of the IERRT project may be completed in a single stage, or it may be sequenced such that construction of the southernmost pier takes place at the same time as operation of the northernmost pier (see Chapter 3 of this ES). Out of these two construction scenarios the single construction period is used as a 'worst-case scenario' since it is the most carbon intensive during construction. Therefore, this impact pathway assessment is considered the worst case and will not be altered by a sequenced construction activity option.

19.8.10 GHG emissions from construction activities will be limited to the duration of the construction programme over an approximate 2-year period. When annualised, the total annual construction emissions equate to around 36,010 tCO_2e per annum.

Table 19.13. Construction phase GHG emissions (2024 to 2025)

Emissions Source	Emissions Factor Source	Emissions Factor	Emissions (tCO2e)	% of Construction Emissions
Enabling Waste	Construction waste - Bricks Department For Business, Energy and Industrial Strategy (BEIS) (2022)	0.99 kg CO2e/tonne	12	<1%
Worker transport (enabling)	Average diesel car + Well to Tank (WTT) BEIS (2022)	0.21 kg CO2e/km	0.04	<1%
Fuel use on site (enabling)	100% mineral diesel + WTT BEIS (2022)	3.33 kg CO2e/l	3	<1%
Materials	A range of emission factors are used from ICE 2019 v3	General Concrete 0.10 kg CO2e/kg Precast Concrete 0.15 kg CO2e/kg Steel Rebar 1.20 kg CO2e/kg Steel Section 1.21 kg CO2e/kg Aggregates and sand 0.01kg CO2e/kg Clay, Brick 0.09 kg CO2e/kg Asphalt, 5% binder 0.05 kg CO2e/kg	69,835	97%
Transport of materials	All rigid HGV + WTT BEIS (2022)	0.16 kg CO2e/tonne/km	462	<1%

Emissions Source	Emissions Factor Source	Emissions Factor	Emissions (tCO2e)	% of Construction Emissions
Construction Activities	Diesel (100% mineral diesel) + WTT BEIS (2022)	3.33 kg CO2e/l	333	<1%
Dredging	TUDelft (2019)	3.90 kg CO2e/m³	741	<1%
Commuting	Average diesel car + WTT BEIS (2022)	0.21 kg CO2e/km	480	<1%
Waste	A range of emission factors are used from BEIS (2022)	Average construction open-loop recycling 0.98 kg CO2e/tonne Landfill (depending on material type) 1.24 / 1.26 kg CO2e/tonne	153	<1%
Annual tCO2e (construction)			72,019	100%
Total			36,010	100%

Operational phase

19.8.11 This section contains an assessment of the potential impacts to the GHG receptors as a result of the operational phase of the IERRT project. Operational emissions were calculated in line with PAS2080 and the GHG protocol methodology across the following GHG emission sources:

- Fuel use/ energy consumption and maintenance;
- Water consumption and wastewater treatment;
- Commuting/ worker transport (enabling);
- Freight and vessel transport; and
- Waste transportation and waste – emissions related to waste production during the operational phase.

19.8.12 Total net GHG emissions from the operational phase of the IERRT project over an engineering design standard of 50 years are estimated to equate to be around 7,235,690 tCO_2e. A breakdown of estimated GHG emissions from operation is presented in Table 19.14 below.

Table 19.14. Operational phase GHG emissions (2025 to 2075)

Emissions Source	Emissions Factor Source	Emissions Factor	Emissions (tCO_2e)	% of Construction Emissions
Freight Transport	The Air Quality chapter (Chapter 13) of the ES informed these results.		39,990	28%
Operational Energy use	Emissions from operational energy use by stationary ships and operational tugs were calculated by the Air Quality assessment (Chapter 13 of this ES) Electricity generated and transmission and distribution (T&D) losses from BEIS (2022)	Operational electricity use 0.23112 kg CO_2e/kW	20,166	14%
International Shipping (Vessels)	Marine fuel oil + well-to-tank (WTT) losses from BEIS (2022)	3.41 kg CO_2e/l	82,470	58%
Commuting	Average diesel car + WTT Bus + WTT from BEIS (2022)	0.21 kg CO_2e/km 0.13 kg CO_2e/km	180	<1%
Maintenance	TUDelft (2019)	3.9 kg CO_2e/m^3	468	<1%
Annual tCO_2e			143,273	100%
Total tCO_2e engineering design standard of 50 years			7,163,671	100%

19.8.13 Emissions from the vessels represent the highest GHG emissions source from the IERRT project, with an estimated annual total of 82,470 tCO_2e. Emissions from freight transport represent the second-largest portion of the emissions, with an estimated annual total of 39,990 tCO_2e.

19.8.14 The emissions from the vessels and terrestrial freight transportation represent a 'worst-case scenario' since the UK plans to decarbonise the UK's road transport and marine transport by 2050. The Transport Decarbonisation Plan (DfT, 2021) and Clean Maritime Plan (DfT, 2019) set out government commitments to achieve net-zero by 2050, in line with the UK's net-zero emissions target. Therefore, it is anticipated that the IERRT project would have a considerably smaller carbon footprint under these decarbonisation plans. Hence, the preceding estimates represent a 'worst-case scenario' where no decarbonising measures are implemented in the future.

19.8.15 Other sources of emissions during the operational phase within the scope of the assessment of the GHG emissions include fuel/ energy consumption, transportation of workers and waste treatment.

Summary of construction and operational phase GHG emissions

19.8.16 The total GHG emissions from the operational phase contribute to the majority of the emissions from the IERRT project over an assumed engineering design standard of 50 years (99%), with the construction phase contributing 1% of the total GHG emissions (see Table 19.15 below).

Table 19.15. Summary of total constuction, operational and demolition phase GHG emissions

Lifecyle Stage	Emissions (tCO2e)	% of Lifecyle Stage Emissions
Construction Phase	72,019	1%
Operational Phase	7,163,671	99%
Total Emissions	7,235,690	100%

Overall significance of effect from GHG emissions (construction and operation)

19.8.17 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 on the atmosphere. To assess the impact of GHG emissions from the IERRT project, the UK Carbon Budgets were used as a proxy for the climate.

19.8.18 The UK's share of international aviation and shipping emissions has only been incorporated into the 6th carbon budget for years 2033-37 (UK Government, 2021). Therefore, GHG emissions from international shipping will only be compared to the UK's 6th Carbon Budget, which is calculated from 2033 onwards.

19.8.19 To contextualise the magnitude of GHG emissions from the IERRT project, these emissions have been compared to the corresponding UK carbon budgets (see Table 19.16 of this ES chapter).

19.8.20 Table 19.16 below displays the estimated annualised GHG emissions from the construction period (41,246 tCO_2e) to the relevant UK National Carbon Budget period. Annualised operational phase emissions excluding vessels (60,624 tCO_2e) are compared to Carbon Budget's 4 and 5, with the 6th Carbon Budget including annualised operational vessel emissions (143,273 tCO_2e).

19.8.21 The IERRT project's GHG emission across the construction and operational phase is below the 5% threshold magnitude set by the IEMA (2022) guidance so it is not considered to have a material impact on the UK's national Carbon Budgets.

Table 19.16. Construction and operational phase GHG emissions against relevant UK carbon budgets

Relevant UK Carbon Budget	Annualised UK Carbon Budget (tCO_2e)	Annual Construction Emissions During Carbon Budget Period (tCO_2e)	Annual Operational Emissions During Carbon Budget Period (tCO_2e)	Total Emissions During Carbon Budget Period (tCO_2e)	Total Emissions as a Proportion of Carbon Budget (%)
4th Carbon Budget (2023 to 2027)	1,950,000,000	93,938	60,624	193,267	0.01%
5th Carbon Budget (2028 to 2032)	1,765,000,000	Not applicable	60,624	303,119	0.02%
6th Carbon Budget (2033 to 2037)	965,000,000	Not applicable	143,273	716,367	0.07%

19.8.22 To put the magnitude of construction emissions into context embodied carbon from construction of the IERRT project has been compared to the Green Construction Board's Embodied Carbon Budget for Infrastructure. The IERRT project is predicted to account for approximately 1% of this budget (see Table 19.17 below). The IERRT project's impact on the Embodied Carbon for Infrastructure Budget and the UK's transition towards a net carbon economy is therefore negligible.

Table 19.17. Construction phase GHG emissions against the Green Construction Board's Embodied Carbon for infrastructure Budget

Period	Infrastructure Embodied carbon ($MtCO_2e$)	Infrastructure embodied carbon ($MtCO_2e$) IERRT project	Total Emissions as a Proportion of Carbon Budget (%)
2024	6.6	0.036	1%
2025	7.1	0.036	1%

19.8.23 In line with the UK government's Clean Maritime Plan and Transport Decarbonisation Plan, it is predicted that the activities occurring at the IERRT will continue to decarbonise in accordance with the budgeted, science based 1.5°C trajectory. Therefore, based on the IERRT project's GHG emissions being below the indicative 5% threshold and the expectation that associated activities will decarbonise in accordance with the UK government's agendas, it is considered that the magnitude of impact from the combination of construction and operation GHG emissions is **minor adverse**. As such, the construction and operation of the IERRT project is not expected to affect the UK in meeting its Carbon Budgets.

CCR review

19.8.24 This section identifies the likely potential effects on the climate receptors as a result of the construction and subsequent operation of the IERRT project.

19.8.25 A full technical assessment of the site's vulnerability to sea-level rise, extreme weather events and intense precipitation is detailed in the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11) of this ES.

19.8.26 The effects of climate change on different receptors in-combination with the other identified impact pathways within the EIA have already been assessed in each topic chapter of this ES through consideration of the future baseline. As the CCR review is only concerned with the assets of the IERRT project and the broader consideration of existing interdependent infrastructure, a cumulative assessment is not required as explained in Chapter 20 of the ES.

Construction phase

19.8.27 This section contains a review of the potential impacts to the CCR receptors as a result of the construction phase of the IERRT project. The following impact pathways have been assessed:

- Inaccessibility to the site;
- Health and safety risks;
- Unsuitable site conditions; and
- Damage to construction materials, plant equipment, assets, and infrastructure.

19.8.28 The construction of the IERRT project may be completed in a single stage, or it may be sequenced such that construction of the southernmost pier takes place at the same time as operation of the northernmost pier (see Chapter 3 of this ES). However, in any case this is not expected to impact the outcome of the CCR review as it would not impact the observed 30-year time slice horizon used in the review.

19.8.29 Table 19.18 below summarises the likely impact pathways over the construction period, assuming it is completed by around 2026 (depending on the construction scenario).

Table 19.18. CCR Review - likely impacts over the construction phase

Impact Pathway	Climate Event	Likely Impact (Climate Event and Hazard Occurring Together)
Inaccessibility to site	Extreme weather events (severe flooding, storms, snow, and ice)	During the construction phase, extreme weather events (severe flooding, storms, snow, and ice) could impact the IERRT project site's accessibility, restricting working hours and delaying the construction schedule.
Health and safety risks	Extreme weather events (severe flooding, storms, snow, ice and heatwaves)	Under a worst-case scenario, construction workers' health and safety would be at risk during extreme weather events, potentially resulting in severe injury and/ or death.
Unsuitable site conditions	Higher peak/ average summer temperatures and increased frequency and intensity of heatwaves	Under the RCP8.5 scenario, year-round temperatures are projected to increase, resulting in higher peak temperatures. Additionally, heatwaves are expected to become more frequent and intense. Therefore, 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.
Damage to construction materials, plant and equipment, assets, and infrastructure	Extreme weather events (severe flooding, storms, snow, ice and heatwaves)	Increased risk of extreme weather events could potentially damage construction materials, plant equipment, assets, and infrastructure. An assessment of the site's risks to extreme weather events is detailed in the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11) of this ES.

Impact Pathway	Climate Event	Likely Impact (Climate Event and Hazard Occurring Together)
	Sea-level rise	Under the assumption that the construction phase is completed by 2026 sea-level rise is forecasted to be marginal across this time period under the RCP8.5 scenario. Therefore, sea-level rise is not expected to impact the construction phase of the IERRT project. Further consideration of the site's risks to sea level rise is detailed in the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11) of this ES.

19.8.30 The CCR Review is qualitative and provides commentary on how the IERRT project will be resilient to climate change within the context of current and predicted future climate conditions during the construction phase of the project. As detailed in Table 19.19 below, **no significant effects** from climate change have been assessed on the IERRT project during the construction phase.

Table 19.19. Adaptation/ resilience measures being implement as part of the construction phase of the IERRT project to improve resilience to climate change

Potential climate changes	Potential impacts on the Development	Adaptation / Resilience measures	Likelihood (Probability of Occurrence based on Table 19.6)	Measure of Consequence (based on Table 19.7)	Significance Level (based on Table 19.8)
Sea-level rise	Under the assumption that the construction phase is completed by mid/ late-2026 sea-level rise is forecasted to be marginal across this time period under the RCP8.5 scenario. Therefore, sea-level rise is not expected to impact the construction phase of the IERRT project. Further consideration of the site's risks to sea level rise is detailed in the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11) of this ES.	It is ABP's intention that the standard of protection afforded by the existing flood defences under their jurisdiction, along both the IERRT site frontage and the wider Port of Immingham, will be kept under consideration and reviewed as appropriate to account for climate change in line with 'Hold the line' management policies in the Flood Risk Management Plan (FRMP) and Shoreline Management Plan (SMP) 3 (Section 11.9 in Chapter 11) of this ES. The Coastal Protection, Flood Defence and Drainage chapter provides more information on this (Section 11.9 in Chapter 11 of this ES).	Negligible	High	NS

Potential climate changes	Potential impacts on the Development	Adaptation / Resilience measures	Likelihood (Probability of Occurrence based on Table 19.6)	Measure of Consequence (based on Table 19.7)	Significance Level (based on Table 19.8)
Higher peak/ average summer temperatures and increased frequency and intensity of heatwaves	Under the RCP8.5 scenario, year-round temperatures are projected to increase, resulting in higher peak temperatures. Additionally, heatwaves are expected to become more frequent and intense. Therefore, 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.	As per standard design practice the following mitigation measures are considered: • Prevention measures and health and safety plans to be developed to prevent worker exhaustion due to heat. • Use of materials with superior properties which offer increased tolerance to high temperatures to be considered. • Regular maintenance of assets to be undertaken to detect deterioration and damage. All new buildings and assets 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	NS

Potential climate changes	Potential impacts on the Development	Adaptation / Resilience measures	Likelihood (Probability of Occurrence based on Table 19.6)	Measure of Consequence (based on Table 19.7)	Significance Level (based on Table 19.8)
Extreme weather events (severe flooding, storms, snow, and ice)	During the construction phase, extreme weather events (severe flooding, storms, snow, and ice) could impact the site's accessibility, restricting working hours and delaying the construction schedule.	Provision of safe refuge within the IERRT terminal building and the production of a flood response plan along with other mitigation measures are detailed in the Coastal Protection, Flood Defence and Drainage chapter (Section 11.9 in Chapter 11 of this ES).	Negligible	High	NS
	Increased risk of extreme weather events could potentially damage construction materials, plant equipment, assets, and infrastructure. An assessment of the site's risks to extreme weather events is detailed in the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11) of this ES.				
	Under a worst-case scenario, construction workers' health and safety would be at risk during extreme weather events, potentially resulting in severe injury and/ or death.				

Operational phase

19.8.31 This section contains a review of the potential impacts on the CCR receptors as a result of the operational phase of the IERRT project. The following impact pathways have been assessed:

- Inaccessibility to the site;
- Health and safety risks;
- Unsuitable site conditions;
- Damage to construction materials, plant equipment, assets, and infrastructure; and
- Increased operational cooling requirements.

19.8.32 The construction of the IERRT project may be completed in a single stage, or it may be sequenced such that construction of the southernmost pier takes place at the same time as operation of the northernmost pier (see Chapter 3 of this ES). However, in any case this is not expected to impact the outcome of the CCR review as these changes to the programme do not impact the observed 30-year time slice horizon used in the CCR review.

19.8.33 Table 19.20 below summarises the likely impact pathways over the operational period assuming the IERRT project.

Table 19.20. CCR Review - likely impacts over the operational phase (2026 to 2076)

Impact Pathway	Climate Event	Likely impact (climate event and hazard occurring together)
In-accessibility to site	Extreme weather events (severe flooding, storms, snow, and ice)	During the IERRT project's operational phase, extreme weather events could impact the site's accessibility, restricting working hours and interrupting the operational schedule.
Health and safety risks	Extreme weather events(severe flooding, storms, snow and ice)	During extreme weather events, operational workers' health and safety would be at risk, potentially resulting in severe injury and/ or death under a worst-case scenario.
Unsuitable site conditions	Higher peak/ average summer temperatures and increased frequency and intensity of heatwaves	Under the RCP8.5 scenario, year-round temperatures are projected to increase, resulting in higher peak temperatures. Additionally, heatwaves are expected to become more frequent and intense. Therefore, 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.

Impact Pathway	Climate Event	Likely impact (climate event and hazard occurring together)
Damage to construction materials, plant and equipment, assets, and infrastructure	Extreme weather events (severe flooding, storms, snow and ice)	Increased risk of extreme weather events could potentially cause damage to structures (e.g., jetties, breakwaters, buildings) and damage to land-based infrastructure, transport, and floating assets. Furthermore, extreme weather events could cause disruption to power and water services which may impact the operation of the port. Additionally, extreme weather events could cause timetabling delays because of the greater incidence of unsafe navigational conditions, which may cause further financial costs. The Port might suffer reputational damage due to damage to floating assets docking at the port during an extreme weather event. The increased frequency of extreme weather events might also increase the requirement for dredging and maintenance, leading to additional costs. The Coastal Protection, Flood Defence and Drainage chapter (Chapter 11) of this ES provides further consideration of the IERRT project's risks to extreme weather events.
	Sea-level rise	Sea-level rise projections for the future are uncertain and largely dependent upon changes in human GHG emissions. An assessment of the risk of the IERRT project to sea-level rise is detailed in the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11) of this ES.
	Increased frequency and intensity of heatwaves	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.

Impact Pathway	Climate Event	Likely impact (climate event and hazard occurring together)
	Increased frequency and intensity of heavy precipitation events	Climate change can increase the intensity and frequency of precipitation. Warmer oceans increase the amount of water that evaporates into the air. When more moisture-laden air moves over land or converges into a storm system, it can produce more intense precipitation (Met Office, 2018a). This may potentially increase the risk of infrastructure and services being damaged by water ingress resulting in downtime to fix damaged infrastructure and services. This would result in economic cost through the replacement of materials, labour, and any economic loss due to the disruption of services.
	Storm surge risk	The latest UKCP18 modelling suggests a relatively small contribution from storm surge changes and it is not yet known whether storm surges will become more severe, less severe or remain the same due to climate change (Met Office, 2018a). However, combined with sea-level rise, storm surges are expected to increase the frequency and magnitude of flooding. Thus, storm surge risk may cause damage to structures (e.g. jetties, breakwaters, buildings) and damage to land-based infrastructure, transport, and floating assets. Furthermore, storm surge events could cause disruption to power and water services which may impact the operation of the port and result in financial loss.
Increased operational cooling requirements	Higher peak/ average summer temperatures and increased frequency and intensity of heatwaves	Higher year-round temperatures could increase operational cooling requirements for operational vessels, plant, equipment and infrastructure.
	Drought risk	Increased risk of droughts could potentially impact the IERRT project's operational requirements where freshwater is required.

19.8.34 As detailed in Table 19.21 below **no significant effects** from climate change have been assessed on the IERRT project during the operation phase.

Table 19.21. Adaptation/ resilience measures being implement as part of the operational phase of the IERRT project to improve resilience to climate change

Potential climate changes	Potential impacts on the IERRT project	Adaptation/ resilience measures	Likelihood (probability of occurrence based on Table 19.6)	Measure of consequence (based on Table 19.7)	Significance level (based on Table 19.8)
Extreme weather events (severe flooding, storms, snow, and ice)	During the IERRT project's operational phase, extreme weather events could impact the site's accessibility, restricting working hours and interrupting the operational schedule	Provision of safe refuge within the terminal building and the production of a flood response plan along with other mitigation measures are detailed in the Coastal Protection, Flood Defence and Drainage chapter (Section 11.9 in Chapter 11 of this ES).	Negligible	High	NS
	During extreme weather events, operational workers' health and safety would be at risk, potentially resulting in severe injury and/ or death under a worst-case scenario.				
	Increased risk of extreme weather events could potentially cause damage to structures (e.g., jetties, breakwaters, buildings) and damage to land-based infrastructure, transport, and floating assets. Furthermore, extreme weather events could cause disruption to power and	The Drainage Strategy is based upon the flood risk assessment's findings to ensure that suitable surface water drainage is embedded into the IERRT project, which considers climate change. The Drainage Strategy is provided in Annex C of the Flood			

Potential climate changes	Potential impacts on the IERRT project	Adaptation/ resilience measures	Likelihood (probability of occurrence based on Table 19.6)	Measure of consequence (based on Table 19.7)	Significance level (based on Table 19.8)
	water services which may impact the operation of the port. Additionally, extreme weather events could cause timetabling delays because of the greater incidence of unsafe navigational conditions, which may cause further financial costs. The Port might suffer reputational damage due to damage to floating assets docking at the port during an extreme weather event. Additionally, the increased frequency of extreme weather events might increase the requirement for dredging and maintenance, leading to additional costs.	Risk Assessment at Appendix 11.1 Volume 3 of ES (Application Document Reference number 8.4).			
Drought risk	Increased risk of droughts could potentially impact the IERRT project's operational requirements where freshwater is required.	In compliance with the ABP (2016) Climate Change Adaptation Report the IERRT project will have embedded heat and drought mitigation measures.	Low	Moderate	NS

Potential climate changes	Potential impacts on the IERRT project	Adaptation/ resilience measures	Likelihood (probability of occurrence based on Table 19.6)	Measure of consequence (based on Table 19.7)	Significance level (based on Table 19.8)
Higher peak average summer temperatures and increased frequency and intensity of heatwaves	Higher year-round temperatures could increase operational cooling requirements for operational vessels, plant, equipment and infrastructure. Under the RCP8.5 scenario, year-round temperatures are projected to increase, resulting in higher peak temperatures. Additionally, heatwaves are expected to become more frequent and intense. Therefore, 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. The increased risk in frequency and intensity of heatwaves could potentially result in damaging infrastructure and services through the increased risk of	In accordance with standard design practice the following mitigation measures are considered: • Prevention measures and health and safety plans to be developed to prevent worker exhaustion due to heat. • Use of materials with superior properties which offer • Increased tolerance to high temperatures to be considered. • Regular maintenance of assets to be undertaken to detect deterioration and damage. All new buildings and assets will either be designed for the climatic	Moderate	Low	NS

Potential climate changes	Potential impacts on the IERRT project	Adaptation/ resilience measures	Likelihood (probability of occurrence based on Table 19.6)	Measure of consequence (based on Table 19.7)	Significance level (based on Table 19.8)
	thermal expansion beyond the design tolerance of the materials.	conditions using appropriate design guidance where available, or adaptive capacity will be built into the designs.			
Sea-level rise	Sea-level rise projections for the future are uncertain and largely dependent upon changes in human GHG emissions. A full technical assessment of the risk of the IERRT project to sea-level rise is detailed in the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11) of this ES.	It is ABP's intention that the standard of protection afforded by the existing flood defences under their jurisdiction, along both the IERRT site frontage and the wider Port of Immingham, will be kept under consideration and reviewed as appropriate to account for climate change in line with 'Hold the line' management policies in the flood risk management plan and Shore Management Plan 3 (Section 11.9 in Chapter 11 of this ES). The Coastal Protection, Flood Defence and	Negligible	High	NS
Storm surge risk	The latest UKCP18 modelling suggests a relatively small contribution from storm surge changes and it is not yet known whether storm surges will become more severe, less severe or remain the same due to climate change (Met Office, 2018a).		Negligible	High	NS

Potential climate changes	Potential impacts on the IERRT project	Adaptation/ resilience measures	Likelihood (probability of occurrence based on Table 19.6)	Measure of consequence (based on Table 19.7)	Significance level (based on Table 19.8)
	However, combined with sea-level rise, storm surges are expected to increase the frequency and magnitude of flooding. Thus, storm surge risk may cause damage to structures (e.g. jetties, breakwaters, buildings) and damage to land-based infrastructure, transport, and floating assets. Furthermore, storm surge events could cause disruption to power and water services which may impact the operation of the port and result in financial loss.	Drainage chapter provides more information on this (Section 11.9 in Chapter 11 of this ES).			
Increased frequency and intensity of heavy precipitation events	Climate change can increase the intensity and frequency of precipitation. Warmer oceans increase the amount of water that evaporates into the air. When more moisture-laden air moves over land or converges into a storm	Using the latest industry guidance, the Drainage Strategy (Annex C to the Flood Risk Assessment at Appendix 11.1 to this ES) considers the projected increase in	Low	Moderate	NS

Potential climate changes	Potential impacts on the IERRT project	Adaptation/ resilience measures	Likelihood (probability of occurrence based on Table 19.6)	Measure of consequence (based on Table 19.7)	Significance level (based on Table 19.8)
	system, it can produce more intense precipitation (Met Office, 2018a). This may potentially increase the risk of Infrastructure and services being damaged by water ingress. Therefore, resulting in downtime to fix damaged infrastructure and services would result in economic cost through the replacement of materials, labour, and any economic loss due to the disruption of services.	peak rainfall intensity allowances.			

Overall CCR review significance summary during construction and operation

19.8.35 The CCR review has considered the climate adaption measures which are integrated into the design during construction and operation (see Table 19.19 and Table 19.21). These measures are considered an adequate response to the projected climate change impacts to which the IERRT project would be exposed. Therefore, the significance level identified through the CCR review is determined as **not significant**. Therefore, no further mitigation is required.

19.9 Mitigation measures

19.9.1 Engagement has been undertaken with relevant environmental disciplines and the engineering design team to discuss the CCR review and identify mitigation measures for incorporation into the design of the IERRT project.

GHG emissions

19.9.2 It is noted that the use of shoreside electrical power to ships at berth, electric vehicle charging points, the phasing out of diesel-powered land-tugs for electric land-tugs, and the use of other electric powered site plant are likely to become more common in future years.

19.9.3 These factors are expected to replace carbon-intensive operational sources of fuel and energy use, thereby contributing towards reducing GHG operational energy use emissions in line with the trajectory towards net-zero.

CCR review

19.9.4 Mitigation measures, including reducing the significance of climate change effects, are summarised in Table 19.22.

Table 19.22. CCR mitigation measures

Climate Event	Mitigation Measures built into the IERRT project
Rising sea-level	It is ABPs intention that the standard of protection afforded by the existing flood defences under their jurisdiction, along both the IERRT project site frontage and the wider Port of Immingham, will be kept under consideration and reviewed as appropriate to account for climate change in line with 'Hold the line' management policies in the FRMP and SMP 3.

Climate Event	Mitigation Measures built into the IERRT project
Increased frequency in severe weather events (e.g. storms)	The Drainage Strategy (Annex C to Appendix 11.1 of this ES) considers the flood risk assessment's findings to ensure that surcharged levels within collector, carrier and receiving systems are appropriately designed and mitigated. The Drainage Strategy considers tide-lock scenarios at flapped outfalls.
Storm surge risk	It is ABPs intention that the standard of protection afforded by the existing flood defences under their jurisdiction, along both the IERRT project site frontage and the wider Port of Immingham, will be kept under consideration and reviewed as appropriate to account for climate change in line with 'Hold the line' management policies in the FRMP and SMP 3.
Increased frequency of heavy precipitation events	Using the latest industry guidance, the Drainage Strategy (Annex C of Appendix 11.1 to this ES) considers the projected increase in peak rainfall intensity allowances.
Increasing average temperatures and increasing frequency of hot days and heatwaves	In adherence with British Design Standards the following mitigation measures are considered: • Prevention measures and health and safety plans to be developed to prevent worker exhaustion due to heat. • Use of materials with superior properties which offer increased tolerance to high temperatures to be considered. • Regular maintenance of assets to be undertaken to detect deterioration and fix damage. • All new buildings and assets will either be designed for the climatic conditions using appropriate design guidance where available, or adaptive capacity will be built into the designs.

19.10 Limitations and assumptions

GHG impact assessment

19.10.1 This assessment has been undertaken based on the following assumptions:

Construction assumptions

- 100% of the brick waste from the demolition activity was assumed to be recycled;
- For the embodied carbon in materials, emission factors were used for the appropriate materials from the Inventory of Carbon and Energy (University of Bath, 2019) version 3 database;
- Appropriate BEIS (2022) emission factors were used for construction energy use, construction activities (with the exception of dredging), transportation and waste;

- BEIS (2022) well to tank (WTT) and transmission and distribution (T&D) loss emissions were added onto fuel, transport and energy emissions where appropriate;
- Information around fuel, energy use and dredging actives carried out during construction was provided by the project team;
- For dredging emissions, Chapters 2 and 3 of the ES informed the dredging activities and research from TUDelft (2019) was applied using the most conservative emissions factor for trailing suction hopper dredgers;
- 5% of all construction materials were assumed as recycled waste using the BEIS (2022) factors, which include waste transportation emissions;
- The transport consultant's technical analysis (Chapter 17 of this ES) was used to inform the estimated number of construction workers on site (150). It was assumed all 150 workers drove individually to the site in an average diesel car travelling a return distance of 20 km across the entire construction period;
- The wastage rate of materials was based on the detail provided in Table 3.1 in Chapter 3 of this ES; and
- In alignment with the site waste management plan (Appendix B of the CEMP – Application Document Reference number 9.2) a worst-case scenario is considered where all of the spoil waste is sent to landfill.

Operational assumptions

- The transport consultant's technical analysis informed the estimated number of operational workers on site (150). It was assumed that 80% of the operational workers drove individually to the site in an average diesel car travelling a return distance of 20 km 365 days of the year. 20% of the other workforce were assumed to travel by an average bus, travelling a return distance of 20 km 365 days of the year;
- Based on the BS EN 1990 Eurocodes it is assumed that the structure will operate over an engineering design standard of 50 years (BS, 2002);
- The Air Quality assessment (Chapter 13) of the ES forms the basis of the terrestrial transportation and localised port vessel emissions based upon unique individual assumptions in order to conduct the Air Quality assessment;
- Appropriate BEIS (2022) emission factors were used for operational energy use, operational activities (with the exception of dredging), transportation and waste;
- BEIS (2022) WTT and T&D loss emissions were added onto the fuel, transport and energy emissions where appropriate;
- Fuel use of an average vessel trip is estimated to be 26 metric tonnes. It was assumed this is the equivalent of 22,100 litres of marine gas oil. Additionally, it was assumed three vessels use 22,100 litres of marine gas oil per day for 365 days of the year; and
- Activities associated with dredging maintenance activities were informed by Chapters 2 and 3 in the ES using the TUDelft 2019 most conservative suction hopper dredgers assumptions.

CCR review

19.10.2 The CCR review was based upon UKCP18 projections over the construction and operational period of the IERRT project. UKCP18 projections compromise a range of uncertainties and caveats, as detailed at Met Office (2018b).

19.10.3 Based on the BS EN 1990 Eurocodes it is assumed that the structure will operate over an engineering design standard of 50 years (BS, 2002).

19.10.4 Furthermore, the emissions scenario for the future climate is also uncertain since the world's emissions will determine this. Thus, a RCP8.5 high emissions scenario has been considered for this assessment to try and determine a business-as-usual scenario, which may not accurately represent the future climate. This is considered a reasonable worst-case scenario.

19.11 Residual effects and conclusions

GHG impact assessment

19.11.1 A summary of the impact pathways that have been assessed, the identified residual impacts and level of confidence are presented in Table 19.23 of this chapter.

19.11.2 The assessment considers the PAS2080 lifecycle stages set out in the scoping report for the construction and operational phases of the IERRT project as summarised in Section 19.8.

19.11.3 Following IEMA (2022) guidance, it is considered that all GHG emissions are classified as being significant because all emissions contribute to climate change. However, to contextualise the significance level, the GHG emissions from construction and operation were compared to the UK Carbon Budgets (Tale 19.16 of this chapter). Based on this comparison the annualised total construction and operational GHG are less than 1% of the relevant UK Carbon Budgets. Therefore, the magnitude of impact during construction and operation is considered 'low'. As such, the construction and operation of the IERRT project is not expected to affect the UK in meeting its Carbon Budgets.

19.11.4 The GHG assessment considers a 'worst-case scenario' where no GHG mitigation measures are implemented into the IERRT project. However, under the condition that these mitigation measures are successfully implemented into the IERRT project they are expected to help contribute towards reducing the operational energy use emissions of the IERRT project.

19.11.5 Furthermore, as a 'worst-case scenario' was used for the spoil waste considering that all of it goes to landfill in line with site was management plan detailed in the Appendix B of the Construction Environmental

Management Plan (Application Document Reference number 9.2). This likely overinflates the GHG numbers as it is likely the spoil will be reuse or recycled, which will produce significantly less emissions so it presents a 'worst-case scenario'.

19.11.6 Furthermore, this GHG assessment represents a 'worst-case scenario' and does not take into account the UK's Transport and Maritime Decarbonisation Plans, which aim for net-zero by 2050. Hence, if these decarbonisation plans are successfully implemented, the IERRT project will have a considerably smaller carbon footprint by 2050, as these emissions sources represent the majority of the IERRT project's GHG emissions.

CCR Review

19.11.7 A number of climate resilience measures have been embedded within the design of the IERRT project. Information on further residual mitigation measures is detailed in the Coastal Protection, Flood Defence and Drainage chapter (Chapter 11) of this ES.

Table 19.23. GHG impact assessment - summary of potential impact, mitigation measures and residual impacts

Receptor	Impact Pathway	Impact Significance	Mitigation Measure	Residual Impact	Confidence
Construction Phase					
The Climate	Demolition	Low	Not applicable	**Minor adverse** (not significant)	Medium
	Land clearance	Low	Not applicable	**Minor adverse** (not significant)	Medium
	Enabling works	Low	Not applicable	**Minor adverse** (not significant)	Medium
	Products	Low	Not applicable	**Minor adverse** (not significant)	Medium
	Transport of products	Low	Not applicable	**Minor adverse** (not significant)	Medium
	Fuel use/ energy consumption	Low	Not applicable	**Minor adverse** (not significant)	Medium
	Water consumption and wastewater treatment	Low	Not applicable	**Minor adverse** (not significant)	Medium
	Transportation of workers	Low	Not applicable	**Minor adverse** (not significant)	Medium
	Freight and vessel transport	Low	Not applicable	**Minor adverse** (not significant)	Medium
	Waste	Low	Not applicable	**Minor adverse** (not significant)	Medium
Operational Phase					
The Climate	Fuel use/ energy consumption	Low	Not applicable	**Minor adverse** (not significant)	Medium
	Water consumption and wastewater treatment	Low	Not applicable	**Minor adverse** (not significant)	Medium
	Transportation of workers	Low	Not applicable	**Minor adverse** (not significant)	Medium
	Freight and vessel transport	Low	Not applicable	**Minor adverse** (not significant)	Medium
	Waste – emissions related to waste production during the operational phase	Low	Not applicable	**Minor adverse** (not significant)	Medium

19.12 References

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19.13 Abbreviations/Acronyms

Acronym	Definition
ABP	Associated British Ports
BEIS	Department for Business, Energy and Industrial Strategy
BS	British Standards
BSI	British Standard Institute
CCR	Climate Change Resilience
CEMP	Construction Environmental Management Plans
CH_4	Methane
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
DCO	Development Consent Order
Defra	Department For Environment, Food & Rural Affairs
DfT	Department for Transport
DTA	David Tucker Associates
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Union
FRMP	Flood Risk Management Plan
GCB	Green Construction Board
GHG	Greenhouse Gas
HFCs	Hydrofluorocarbons
HGV	Heavy goods Vehicle
ICCI	In-combination Climate Change Impacts
ICE	Inventory carbon and energy
ID	Identification
IEMA	Institute for Environmental Management and Assessment
IERRT	Immingham Eastern Ro-Ro Terminal
IPCC	Intergovernmental Panel on Climate Change
MHCLG	Ministry for Housing, Communities and Local Government
MtCO2e	Million Tonnes of Carbon Dioxide Equivalent
N/A	Not Applicable

N2O	Nitrous Oxide
NF3	Nitrogen Trifluoride
NLC	North Lincolnshire Council
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NPSfP	National Policy Statement for Ports
NS	Not Significant
NSIP	Nationally Significant Infrastructure Project
ºC	Degree Celsius
PAS	Publicly Available Specification
PEIR	Preliminary Environmental Information Report
PFCs	Perfluorocarbons
PINS	Planning Inspectorate
RCP	Representative Concentration Pathway
S	Significant
SF_6	Sulphur Hexafluoride
SMP	Shoreline Management Plan
T&D	Transmission and Distribution
tCO_2e	Tonnes of Carbon Dioxide Equivalent
UK	United Kingdom
UKCP18	UK Climate Projections 2018
UNFCCC	United Nations Framework Convention on Climate Change
WBCSD	World Business Council for Sustainable Development
WRI	World Resources Institute
WTT	Well to tank

Cardinal points/directions are used unless otherwise stated.
SI units are used unless otherwise stated.

19.14 Glossary

Term	Definition
Climate hazard	A physical process or event (hydro-meteorological or oceanographic variables or phenomena) that can harm human health, livelihoods, or natural resources
Lifecycle GHG impact assessment	Lifecycle GHG impact assessment converts inventory data, construction data, and operational data from a life cycle assessment into a set of potential impacts
Climate resilience	The capacity of a social-ecological system to cope with a hazardous event or disturbance, responding or reorganising in ways that maintain its essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation

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