

Viking CCS pipeline

Preliminary Environmental Information Report Volume IV

Technical Appendices



Appendix 11.4

Preliminary Flood Risk Assessment



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11 Preliminary Flood Risk Assessment

11.1 Introduction

- 11.1.1 This Preliminary Flood Risk Assessment (PFRA) has been produced in support of the Preliminary Environmental Information Report (PEIR) for the Viking CCS Pipeline.
- 11.1.2 The Viking CCS Project intends to transport compressed and conditioned carbon dioxide (CO₂) from the Immingham Facility to store in depleted gas reservoirs in the Southern North Sea. The main elements of the Viking CCS Pipeline (hereafter referred to as 'the Project') in relation to the PEIR is the Immingham Facility, onshore pipeline from Immingham to the Theddlethorpe, the Theddlethorpe Facility and offshore pipeline up to Mean Low Water Spring (MLWS). As such the key components can be condensed as:
- Immingham Facility;
 - Approximately 55.6 km buried pipeline (including cathodic protection);
 - Block Valve Stations;
 - Theddlethorpe Facility;
 - Existing LOGGS Pipeline down to extent of Development Consent Order (DCO) limits at MLWS;
- 11.1.3 Full details of the various Project components are provided in *PEIR Volume II Chapter 3: The Viking CCS Pipeline*.
- 11.1.4 The Draft Order Limits are shown on Figure 3-5 (*PEIR Volume II, Chapter 3*). The Draft Order Limits are provisional and for the purposes of this report only. The final Draft Order Limits for the purposes of the DCO application, including land for the connection corridors and temporary land required during construction of the Project, will be refined through on-going studies and taking into account the responses to the statutory consultation. Only the pipeline route within the Draft Order Limits has been assessed at this stage. Any associated above ground structures will be assessed as part of the EIA.
- 11.1.5 For the purposes of this report the terms used to identify the various parts of the pipeline are outlined below and are consistent with the terms used elsewhere in the PEIR.
- 11.1.6 The Draft Order Limits are divided into the following areas (described in more detail in *Chapter 3: The Viking CCS Pipeline* (PEIR Volume II) and shown on Figure 3-5 (*Chapter 3*):
- Section 1: Rosper Road to A180;
 - Section 2: A180 to A46;
 - Section 3: A46 to Pear Tree Lane;
 - Section 4: Pear Tree Lane to Manby Middlegate (B1200); and
 - Section 5: Manby Middlegate (B1200) to Theddlethorpe Facility and down to Mean Low Water Spring (MLWS).

11.2 Purpose and Scope of the Assessment

- 11.2.1 The Environment Agency's (EA) Flood Map for Planning (Rivers and Sea) (Ref 11-14) indicates that the proposed CO₂ pipeline crosses Flood Zones 1, 2 and 3, defined as having a 'low', 'medium' and 'high' risk of flooding from fluvial or tidal sources. The definition of

flood zones, in accordance with the Planning Policy Guidance (PPG) (Ref 11-2) are summarised in **Table 11-4**.

- 11.2.2 As shown on the EA's 'Flood Map for Planning' (Ref 11-14), the majority of the pipeline lies within Flood Zone 1, however some sections lie within Flood Zone 2 (medium risk of flooding from fluvial or tidal sources) and Flood Zone 3 (high risk of flooding from fluvial or tidal sources), for example, where the pipeline crosses a watercourse. Sections 1 and 5 lie predominantly within the tidal extent of Flood Zone 3, associated with tidal flood risk from the River Humber and the North Sea.
- 11.2.3 The National Planning Policy Framework (NPPF) and the PPG specify that applications for development proposals greater than 1 ha in area, or located in Flood Zone 2 or 3, should be accompanied by an FRA that identifies and assesses all forms of flooding to and from the development. An FRA should demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking into account the vulnerability of the Project, the potential impact of climate change and ensure there is no adverse impact on flood risk elsewhere
- 11.2.4 The aim of this study is to undertake a preliminary FRA that is appropriate to the nature and scale of the Project, which determines flood risk arising from the Project, and, where required, recommend suitable mitigation measures. The assessment is limited by the high-level/indicative design information available at this stage. The FRA will be refined once the proposed levels (e.g. above or below ground) of the pipeline are confirmed.
- 11.2.5 The PFRA assesses the pipeline route itself, which is below ground across the entire route including at watercourse crossings. Any associated above ground structures have not been assessed at this stage and will be assessed at a later stage.
- 11.2.6 The objectives of this report are to:
- Collect and review existing information relating to the flood risk posed to the Project from all sources (e.g. fluvial, tidal, surface water, artificial, groundwater, drain and sewer flooding);
 - Assess the flood risk to the Project under existing and post-development conditions (taking into account climate change) using publicly available information; and
 - Outline potential mitigation measures needed to ensure the Project will be safe for the lifetime of the development and to meet the requirements of the NPPF.

11.3 Data Sources

- 11.3.1 The baseline conditions for the Site have been established through a desk study including a review of publicly available information and supporting modelling and hydrology study reports (where available), and via consultation with the associated Lead Local Flood Authorities (LLFA), the EA and Internal Drainage Boards (IDB) at a later stage. This information has been utilised to inform the assessment made within the PFRA. Data collected during the course of this assessment is described in **Table 11-1**.

Table 11-1: Sources of Data

Purpose	Data Source	Comments
Identification of Hydrological Features	1: 10,000 Ordnance Survey (OS) mapping	Identifies the position of the Site, local hydrological features, and riparian owners.
Identification of Existing Flood Risk	Environment Agency FMfP (Ref 11-14)	Identifies fluvial/ tidal inundation extents.
	Environment Agency Long Term Flood Risk Maps (Ref 11-16)	Identification of flood risk from surface water and reservoirs.
	DEFRA Groundwater Conditions Map (Ref 11-31)	Identification of groundwater designations through geology.
	North East Lincolnshire Council Preliminary Flood Risk Assessment (PFRA) (North East Lincolnshire, 2011) (Ref 11-22) North East Lincolnshire Council Strategic Flood Risk Assessment (SFRA) (North East Lincolnshire, 2011) (Ref 11-32) Lincolnshire Council Preliminary Flood Risk Assessment (PFRA) (Ref 11-17) East Lindsey District Council Strategic Flood Risk Assessment (SFRA) (Ref 11-7) Consultation with Environment Agency, East Lindsey Council (LLFA), North East Lincolnshire Council (LLFA), Lindsey Marsh (IDB) and North East Lindsey (IDB) will be undertaken at the next stage of assessment	Assesses flood risk across the North East Lincolnshire Council and East Lindsey District Council boundary areas. Includes flood risk from fluvial/tidal, sewers, overland flow and groundwater.
Identification of Historical Flooding	SFRAs and PFRAs Consultation (as above)	Provides details of historical flooding.
Details of the Project	<i>PEIR Volume II Chapter 3: The Viking CCS Pipeline</i>	Provides indicative layouts of the Project
Crossing Schedule	Schedule of Crossings	Provides details of indicative watercourse crossings
Surface Water Drainage	Assumed based on SuDS Principles	

11.4 Site Information

Location

- 11.4.1 The Project is a pipeline and associated infrastructure which will transport compressed and conditioned dense phase CO₂ from the delivery point at Immingham onward via the existing LOGGS pipeline up to Mean Low Water Spring (MLWS).

11.5 Geology and Hydrology

Surface Water Features

- 11.5.1 A Site walkover was undertaken on 25 May 2022. Using observations taken on this visit, data from OS mapping and the EA, the following named surface waterbodies (listed in **Table 11-2**) were identified to be crossed by the Draft Order Limits, as identified by the crossing schedule.

Table 11-2: Surface Waterbodies

Section	Waterbody	Type	Watercourse Description
1-5	River Humber (North Sea)	Tidal River	The Humber Estuary extends from Trent Falls, Faxfleet to the North Sea (at Spurn Point)
1	Haborough Marsh Drain	Ordinary Watercourse	Haborough Marsh Drain extends from South Killingholme Road to the Humber Estuary and is managed by North-East Lindsey IDB
2	North Beck Drain	Ordinary Watercourse	North Beck Drain extends from Keelby to the Humber Estuary. The Drain is managed by North-East Lindsey from Keelby to Stallingborough Road, where it becomes a Main River.
2	Old Fleet Drain	Ordinary Watercourse	Old Fleet Drain extends from Healing to the Humber Estuary. The Drain is managed by North-East Lindsey IDB from Healing to Stallingborough Road, where it becomes a Main River.
3	Laceyby Beck	Ordinary Watercourse	Laceyby Beck extends from Welbeck Hill to the Humber Estuary. The Beck is managed by North-East Lindsey IDB from Welbeck Hill to the confluence with Team Gate Drain, where it becomes a Main River.
3	Waithe Beck	Main River	Waithe Beck extends from Kirmond Top Hall to Tetney, where the Beck becomes Tetney Drain / Mother Drain.
3	Black Leg Drain	Ordinary Watercourse	Black Leg Drain extends upstream of North Thoresby and joins New Dike downstream of North Thoresby. The Drain

Section	Waterbody	Type	Watercourse Description
			is an ordinary watercourse until it becomes Main River at North Thoresby.
4	Poulton Drain	Ordinary Watercourse	Poulton Drain extends south of Ludborough to Louth Canal. The Drain is an ordinary watercourse between Ludborough and Covenham St Mary, where it becomes Main River.
4	Yarburgh Beck	Ordinary Watercourse	Yarburgh Beck extends from Little Grimsby to Yarburgh, where it joins Black Dike.
4	Louth Canal	Main River	Louth Canal extends from Louth to Tetney Haven.
4	River Ludd (Lower)	Main River	The River Ludd extends from Louth to Melholme. The River is Main River from Louth to Alvingham, and then becomes an Ordinary Watercourse before joining Seven Towns North Eau.
4	Green Dike	Ordinary Watercourse	Green Dike extends from Rushmoor Country Park to new lands, where it joins South Dike.
4	Harrowsea Drain	Ordinary Watercourse	Harrowsea Drain extends from South Cockerington to new lands, where it joins South Dike.
4	Greyfleet Drain	Main River	Greyfleet Drain extends from Grimoldby Grange to Saltfleet, where it joins Saltfleet Haven.
4	Manby Middlegate Drain	Ordinary Watercourse	Manby Middlegate Drain extends from Eastfield Farm to Grimoldby Ings where it joins Sykes Drain.
4	Manby Middle Drain	Ordinary Watercourse	Manby Middle Drain extends from Middlegate Drain.
5	Sykes Drain	Ordinary Watercourse	Sykes Drain extends from Causeway Bridge to Grimoldby Ings, where it joins Grayfleet Drain.
5	Head Dike Drain	Ordinary Watercourse	Head Dike Drain extends from Manby to Willow Farm.
5	Long Eau	Main River	The Long Eau extends from Castle Carlton to Theddlethorpe, where it joins the Great Eau.
5	The Cut Drain	Ordinary Watercourse	The Cut Drain extends from Causeway Bridge to Theddlethorpe All Saints.
5	Two Mile Bank Drain	Ordinary Watercourse	Two Mile Bank extends from downstream of Great Carlton to Gayton Le Marsh

Section	Waterbody	Type	Watercourse Description
			Grange, where it joins from New Gayton Engine Drain.
5	Gayton North Fen Drain	Ordinary Watercourse	Gayton North Fen Drain extends from Gayton Le Marsh to Gayton Le Marsh Grange.
5	New Gayton Engine Drain	Ordinary Watercourse	New Gayton Engine Drain extends from Pyewipe Farm to Highbridge where it joins The Cut.
5	Old Engine Drain	Ordinary Watercourse	Old Engine Drain extends from Gayton Le Marsh Grange to Gayton Engine.
5	Great Eau	Main River	The Great Eau extends from Calceby Beck Houses to Saltfleet. The Great Eau becomes a Main River at Belleau.
5	Grove Road Drain	Ordinary Watercourse	Grove Road Drain extends from Will Row to Theddlethorpe All Saints where it joins The Cut.
5	Mills and Harps Drain	Ordinary Watercourse	Mills and Harps Drain extends from Neves Farm to Mablethorpe Road where it joins Rotten Row Drain.
5	Rotten Row Drain	Ordinary Watercourse	Rotten Row Drain extends from Park Farm to Mablethorpe Road where it joins The Cut.
5	The Cut	Ordinary Watercourse	The Cut extends from Theddlethorpe All Saints to Theddlethorpe Gas Terminal.

11.5.2 In addition to the watercourses described in **Table 11-2**, there are a significant number of drains and ditches in the Study Area. These relate to industrial drainage infrastructure, artificial agricultural drainage channels, and drainage channels associated with the tidal/coastal nature of the location, designed to drain tidal floodwater away. Many of these are managed by North East Lindsey and Lindsey Marsh Internal Drainage Boards (IDB).

11.5.3 The EA, North East Lindsey IDB and Lindsey Marsh IDB own and maintain several flood defence assets along the pipeline route.

Anticipated Ground Conditions and Hydrogeological Significance

11.5.4 The geology of the Project is described in detail within *PEIR Volume II Chapter 9: Geology and Hydrogeology*, however these have been summarised in this PFRA to provide context for any potential groundwater flood risks.

Geology

11.5.5 Bedrock and superficial geology present beneath the Draft Order Limits is summarised in **Table 11-3**.

Table 11-3: Geology

Section	Superficial Geology	Bedrock Geology
1	Glacial Till Tidal Flat Deposits Glaciofluvial Deposits Alluvium Lacustrine Deposits	Burnham Chalk Formation
2	Glacial Till Glaciofluvial Deposits	Burnham Chalk Formation Welton Chalk Formation
3	Glacial Till Alluvium Lacustrine Deposits Glaciofluvial Deposits	Burnham Chalk Formation Welton Chalk Formation
4	Glacial Till Alluvium Lacustrine Deposits Glaciofluvial Deposits	Welton Chalk Formation
5	Glacial Till Tidal Flat Deposits Alluvium	Burnham Chalk Formation Welton Chalk Formation

Hydrogeology

11.5.6 Figures 9-4 and 9-5 (PEIR, Volume II, Chapter 9) present the designated superficial and bedrock aquifers below the Draft Order Limits, respectively. The designated aquifers have been defined by the EA below:

- **Principal Aquifer:** *“layers of rock or drift deposits that have high intergranular and / or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and / or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer”;*
- **Secondary Aquifer – A:** *“permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers”;*
- **Secondary Aquifer – B:** *“predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers”;*
- **Secondary Aquifer – Undifferentiated:** *“has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type”;* and

- **Unproductive Strata:** *“These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow”.*

11.5.7 The entire stretch of Draft Order Limits is underlaid by a Principal Aquifer. Sections 1 – 4 of the Draft Order Limits are located within a Source Protection Zone (SPZ). Groundwater SPZs monitor the risk of contamination for any activities that may cause pollution to the surrounding area.

11.6 The Project

11.6.1 The Viking CCS Project intends to transport compressed and conditioned dense phase CO₂ from the delivery point at Immingham to storage in depleted gas reservoirs in the Southern North Sea.

11.6.2 The Viking CCS Pipeline comprises the development of an approximately 55.6 kilometre (km) pipeline between Immingham and Theddlethorpe to expand onshore CO₂ capture infrastructure and capability within the Humber region. Onshore pipelines over 16.093 km in length classify as National Significant Infrastructure Projects pursuant to section 14(1)(g) of the Planning Act 2008 (as amended) and required a Development Consent Order (DCO). An application for DCO will be submitted to Secretary of State (SoS) for Business, Energy & Industrial Strategy (BEIS) via the Planning Inspectorate. The DCO application will be accompanied by an Environmental Statement (ES) prepared in accordance with the infrastructure Planning (Environmental Impact Assessment) (EIA) Regulations, which will include the full Flood Risk Assessment.

Components of the Project

11.6.3 The main elements of the Viking CCS Project comprises:

- CO₂ source, conditioning and compression (e.g. by HumberZero, which is a ground-breaking green project aimed at decarbonising energy intensive industry);
- The Viking CCS Pipeline (the Project to which this PEIR relates), which consists of the Immingham Facility; onshore pipeline from Immingham to the Theddlethorpe Facility and offshore pipeline tie-in and outlet up to Mean Low Water Spring (MLWS);
- Transportation via the existing and repurposed Lincolnshire Offshore Gas Gathering System (LOGGS) pipeline system (the existing offshore pipeline) from the former TGT site to MLWS tide mark, to approximately 120 km offshore, along with the development of an additional 23 km subsea pipeline spur extension;
- Not Permanently Attended Installation (NPAI): new installation, containing injection facilities, including wellheads; and
- The utilisation of depleted gas reservoirs in the Viking area of the North Sea for CO₂ injection and storage.

Viking CCS Pipeline – Key Components

11.6.4 Key components of the Viking CCS Pipeline comprise the following:

- Immingham Facility;
- Approximately 55.6 km buried 24 inch (“) Onshore Pipeline (including cathodic protection);
- Block Valve Stations;
- Theddlethorpe Facility; and
- Existing LOGGs Pipeline to the extent of the DCO limits at MWLS.

11.6.5 Only the pipeline route has been assessed within the PFRA at this stage. The Proposed pipeline route is assumed to be below ground for its entire length, including at watercourse crossings. The other components will be assessed at a later stage and for the full FRA.

11.7 Planning Policy

National Policy Statements for Energy Infrastructure

- 11.7.1 A number of National Policy Statements (NPS) for energy infrastructure were designated by the Secretary of State (SoS) under the Planning Act 2008 on 19 July 2011 (Ref 11-3, Ref 11-4 and Ref 11-5), specifically NPS for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) together with the Overarching NPS for Energy (EN-1). These cover Nationally Significant Infrastructure Projects that fall under the Planning Act 2008.
- 11.7.2 EN-1 states in Paragraph 5.7.4 that *“applications for energy projects of 1 hectare or greater in Flood Zone 1 and all proposals for energy projects located in Flood Zone 2 and 3 should be accompanied by a NPPF compliant flood risk assessment”*.
- 11.7.3 In determining an application for consent, EN-1 states that the decision-maker should be satisfied that where relevant:
- The application is supported by an appropriate FRA;
 - The Sequential Test has been applied as part of site selection;
 - A sequential approach has been applied at the site level to minimise risk by directing the most vulnerable uses to areas of lowest flood risk;
 - The proposal is in line with the relevant national and local flood risk management strategy;
 - Priority has been given to the use of Sustainable Drainage Systems (SuDS); and
 - In flood risk areas the proposed development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be managed over the lifetime of the development.
- 11.7.4 Section 5.7.12 of NPS EN-1 also states that developments in Flood Zone 2 should not be consented unless the Sequential Test requirements have been met. It also states that developments in Flood Zone 3 should not be consented unless the Sequential and Exception Test requirements have been met.
- 11.7.5 The Sequential Test is set out in paragraph 5.7.13 and states that preference should be given to locating projects in Flood Zone 1, unless there is no reasonably available site in Flood Zone 1, then projects can be located in Flood Zone 2. If there is no reasonable alternative site in Flood Zones 1 or 2, then nationally significant energy infrastructure projects can be located in Flood Zone 3, subject to the Exception Test.
- 11.7.6 Sections 5.7.14 - 5.7.16 of NPS EN-1 states that the Exception Test provides a method of managing flood risk while still allowing necessary development to occur. The Exception Test is only appropriate for use where the sequential test alone cannot deliver an acceptable site, taking into account the need for energy infrastructure to remain operational during floods. All three elements of the test will have to be passed for development to be consented. For the Exception Test to be passed:
- It must be demonstrated that the project provides wider sustainability benefits to the community that outweigh flood risk;
 - The project should be on developable, previous developed land or, if it is not on previously developed land, that there is no reasonable alternative sites on

developable previously developed land subject to any exceptions set out in the technology-specific NPSs; and

- A FRA must demonstrate that the project will be safe, without increasing flood risk elsewhere and, where possible will reduce flood risk overall.

National Planning Policy Framework

11.7.7 Published by the Ministry of Housing, Communities and Local Government, the National Planning Policy Framework (NPPF) (Ref 11-21) was updated in July 2021. The NPPF has three overarching objectives to contribute to the achievement of sustainable development, one of which is the ‘environmental objective’.

11.7.8 The NPPF contains several statements which are relevant to flood risk. These include:

- Strategic policies should set out an overall strategy for:
 - Infrastructure for transport, telecommunications, security waste management, water supply, wastewater, flood risk and coastal change management, and the provision of minerals and energy (including heat) (Paragraph 20b); and
 - conservation and enhancement of the natural, built and historic environment. This includes landscapes and green infrastructure, and planning measures to address climate change mitigation and adaptation (Paragraph 20d).
- Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts.
- Development should not cause unacceptable levels of water pollution and should help improve water quality wherever possible (Paragraph 153).
- Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere (Paragraph 159).
- Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:
 - Take account of advice from the lead local flood authority;
 - Have appropriate proposed minimum operational standards;
 - Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
 - Where possible, provide multifunctional benefits (Paragraph 169).

11.7.9 The requirements of the NPPF with regards to flood risk have been taken into account in the assessment.

11.8 National Planning Policy Guidance

11.8.1 The PPG (Ref 11-2) provides guidance for local planning authorities on assessing the significance of proposed developments. The guidance highlights that adequate water and wastewater infrastructure is needed to support sustainable development.

11.8.2 The NPPF and Flood Risk and Coastal Change section of the PPG recommend that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA) and develop

policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as Lead Local Flood Authorities (LLFAs) and IDBs. Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to people and property and manage any residual risk, taking account of the impacts of climate change, by:

- Applying the Sequential Test;
- Applying the Exception Test, if necessary;
- Safeguarding land from development that is required for current and future flood management;
- Using opportunities offered by new development to reduce the causes and impacts of flooding; and
- Seeking opportunities to facilitate the relocation of existing development, including housing, to more sustainable locations if climate change is expected to increase flood risk.

11.8.3 The NPPF states that when determining planning applications, LPAs should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific FRA. Development should only be allowed in areas at risk of flooding where, in light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

- Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
- The development is appropriately flood resistant and resilient;
- It incorporates Sustainable Drainage Systems (SuDS), unless there is clear evidence that this would be inappropriate;
- Any residual risk can be safely managed; and
- Safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

11.8.4 Major developments should incorporate SuDS unless there is clear evidence that this would be inappropriate. The systems used should:

- Take account of advice from the Lead Local Flood Authority;
- Have appropriate proposed minimum operational standards;
- Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
- Where possible, provide multifunctional benefits.

11.8.5 All sources of flooding should be considered in order to steer development at the planning stage to area at the lowest risk of flooding in order to satisfy the Sequential Test. The Flood Zone definitions are presented in Table 1 of the PPG and are defined in **Table 11-4** below.

Table 11-4: Flood Zone Definitions

Flood Zone	Definition	Risk of flooding
Flood Zone 1	Land that has a low probability of flooding (less than 1 in 1,000 annual probability of river or sea flooding (<0.1%))	Low
Flood Zone 2	Land that has a medium probability of flooding (between 1 in 100 and 1 in 1,000 annual probability of river flooding (0.1-1%), or between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.1-0.5%))	Medium
Flood Zone 3a	Land that has a high probability of flooding (1 in 100 year or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%))	High
Flood Zone 3b (Functional Floodplain)	This zone comprises land where water has to flow or be stored in times of flood.	Very High

Source: Planning Practice Guidance (2022)

11.8.6 As discussed in Section 11.2.1 the Environment Agency’s ‘Flood Map for Planning’ identifies that the majority of the central section of pipeline is located in Flood Zone 1, with a number of the watercourse crossings located in Flood Zones 2 and 3. Sections 1 and 5 of the Draft Order Limits are predominantly located within the tidal extents of Flood Zones 2 and 3.

Sequential Test

11.8.7 A Sequential Test is required to assess flood risks across strategic development sites and the NPPF/ PPG recommends that the test be applied at all stages of the planning process to direct new development to areas with the lowest probability of flooding (Flood Zone 1).

11.8.8 Parts of the Draft Order Limits (Sections 1, 5 and the watercourse crossings) are located in Floods Zones 2 and 3 as defined in the Environment Agency’s ‘Flood Map for Planning’ and the Project is for compressed CO₂ transportation. In the NLC Local Development Framework (Ref 11-26) Policy CS18 – Sustainable Resource Use and Climate Change states that the council will “support new technology and development for carbon capture and the best available clean and efficient energy technology, particularly in relation to the heavy industrial users in North Lincolnshire, to help reduce CO₂ emissions”. There is not an alternative route available that avoids flood zones (see PEIR Volume II Chapter 2). As such, it is considered that the Sequential Test is passed.

11.8.9 According to Table 2 of the PPG, the proposed development of a buried compressed CO₂ pipeline comprises the vulnerability classification of ‘Essential Infrastructure’ which is defined in Annex 3 of the NPPF (Ref 11-22) as

- “Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including infrastructure for electricity supply including generation, storage and distribution systems; including electricity generating power stations, grid

and primary substations storage; and water treatment works that need to remain operational in times of flood.

- *Wind turbines.*
- *Solar farms.”*

11.8.10 Table 3 within the PPG (replicated in **Table 11-5** below) provides a matrix identifying which vulnerability classifications are appropriate which each Flood Zone.

Table 11-5: Flood Risk Vulnerability and Flood Zone Compatibility

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone 1	✓	✓	✓	✓	✓
Flood Zone 2	✓	✓	Exception test required	✓	✓
Flood Zone 3a	Exception test required	✓	✗	Exception test required	✓
Flood Zone 3b (Functional Floodplain)	Exception test required	✓	✗	✗	✗
Key ✓ <i>Development is appropriate.</i> ✗ <i>Development should not be permitted</i>					

Exception Test

11.8.11 As **Table 11-5** indicates, essential infrastructure is appropriate in Flood Zones 1 and 2, however, the application of the Exception Test is required for the elements of the Site located in Flood Zone 3. The PPG states that for the Exception Test to be passed it must be demonstrated that:

- *the development provides wider sustainability benefits to the community that outweigh flood risk; and*
- *the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere and, where possible, will reduce flood risk overall.*

11.8.12 Both elements of the test will have to be passed for development to be allocated or permitted. The FRA to be produced and submitted with the DCO application will address to requirements of the exception test.

11.9 Environment Agency Climate Change Guidance (2022)

11.9.1 The EA published updated climate change allowances in May 2022 (Ref 11-15) to support NPPF, which supersede all previous allowances written in the ‘PPG: Flood Risk & Coastal Change’ and are predictions of anticipated change for:

- Peak river flow by River Basin District;

- Peak rainfall intensity;
- Sea level rise; and
- Offshore wind speed and extreme wave height.

11.9.2 These should be considered within an FRA in regard to future impacts from climate change on site specific planning applications. The EA’s guidance outlines how and when allowances should be applied for FRAs.

Tidal Climate Change Allowances

11.9.3 **Table 11-6** is extract replicated from the EA guidance detailing the revised anticipated rise in sea levels up to 2125 (The total sea level rise for each epoch is in brackets).

Table 11-6: Sea level allowances by river basin district for each epoch in mm for each year (based on a 1981 to 2000 baseline)

Areas of England	Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (metres)
Anglian	Higher Central	5.8 (203)	8.7 (261)	11.6 (348)	13 (390)	1.20
	Upper End	7 (245)	11.3 (339)	15.8 (474)	18.1 (543)	1.60
Humber	Higher Central	5.5 (193)	8.4 (252)	11.1 (333)	12.4 (372)	1.15
	Upper End	6.7 (235)	11 (330)	15.3 (459)	17.6 (528)	1.55

11.9.4 Given the nationally significant status of the development proposal, it may be necessary to assess the credible maximum climate change scenario (H++) for sea level rise, comprising 1.9m for the total sea level rise to 2100. A detailed climate change assessment will be provided during the next phase of the assessment.

Fluvial Climate Change Allowances

11.9.5 For proposed developments in areas of fluvial flood risk (the watercourse crossings), the flood risk vulnerability classification, the flood zone and lifetime of development are of particular importance to determine the correct climate change allowance as detailed in **Table 11-7**.

Table 11-7: Environment Agency Climate Change Allowances to apply based upon the Flood Zone and Development Land Use Vulnerability

	Water Compatible	Less Vulnerable	More Vulnerable	Highly Vulnerable	Essential Infrastructure
Flood Zone 1	CA	CA	CA	CA	CA
Flood Zone 2	CA	CA	CA	CA	HCA
Flood Zone 3a	CA	CA	CA	X	HCA
Flood Zone 3b	CA	X	X	X	HCA

CA = Central Allowance; HCA = Higher Central Allowance; X = Development not permitted

11.9.6 As the Project is defined as ‘Essential Infrastructure’ from the vulnerability classifications in Table 2 of the NPPF, the corresponding allowances that should be assessed within the Louth, Grimsby and Ancholme and Witham Management Catchments can be extracted from **Table 11-8**. The central allowance should be used to assess the sections of the proposed pipeline located in Flood Zone 1 and the higher central allowance should be used to assess the sections located in Flood Zones 2 and 3.

Table 11-8: Environment Agency Peak River Flow Climate Change Allowances for the Louth, Grimsby and Ancholme and Witham Management Catchments

Management Catchment	Allowance	Total potential change anticipated for ‘2020s’ (2015 to 2039)	Total potential change anticipated for ‘2050s’ (2040 to 2069)	Total potential change anticipated for ‘2080s’ (2070 to 2115)
Louth, Grimsby and Ancholme	Upper End Allowance	4%	12%	33%
	Higher Central Allowance	-1%	5%	19%
	Central Allowance	4%	9%	21%
Witham	Upper End Allowance	21%	32%	57%
	Higher Central Allowance	8%	15%	32%
	Central Allowance	9%	14%	27%

Pluvial Climate Change Allowances

11.9.7 To account for the anticipated changes in rainfall intensity, the corresponding allowances that should be assessed within the Louth, Grimsby and Ancholme and Witham Management Catchments are listed in **Table 11-9**.

Table 11-9: Peak Rainfall Intensity Allowances for the Louth, Grimsby and Ancholme and Witham Management Catchments

Parameter		Allowance	Total potential change anticipated for '2050s'	Total potential change anticipated for '2070s'
Louth, Grimsby and Ancholme	1% annual exceedance rainfall event (2070 – 2115)	Upper End	40%	40%
		Central	20%	25%
	3.3% annual exceedance rainfall event (2070 – 2115)	Upper End	35%	35%
		Central	20%	25%
Witham	1% annual exceedance rainfall event (2070 – 2115)	Upper End	40%	40%
		Central	20%	25%
	3.3% annual exceedance rainfall event (2070 – 2115)	Upper End	35%	35%
		Central	20%	25%

11.9.8 When assessing a range of allowances for peak tidal, river flow or rainfall intensity, the following must be considered:

- Likely depth, spend and extent of flooding for each of the assessed climate change allowances;
- Vulnerability of the proposed development types or land use allocations to flooding;
- 'Built in' resilience measures used, for example, raised floor levels; and
- Capacity or space in the development to include additional resilience measures in the future, using a 'managed adaptive' approach.

11.10 Regional Policy

Humber River Basin District Flood Risk Management Plan

11.10.1 The Environment Agency is required to prepare Flood Risk Management Plan's (FRMPs) for all of England covering flooding from Main Rivers, the sea and reservoirs.

11.10.2 The Humber River Basin District FRMP (Ref 11-13) has been published by the EA and sets out objectives to manage flood risk for the period 2015 to 2021. The Project is located in the Louth, Grimsby and Ancholme Management Catchment.

Anglian River Basin District Flood Risk Management Plan

11.10.3 The Anglian River Basin District FRMP (Ref 11-12) has been published by the EA and sets out objectives to manage flood risk for the period 2015 to 2021. The Project is located in the Witham Management Catchment.

Grimsby and Ancholme Catchment Flood Management Plan

- 11.10.4 The role of Catchment Flood Management Plans (CFMP) are to identify flood risk management policies which will assist all key decision makers in the catchment to deliver sustainable flood risk management for the long term. The Grimsby and Ancholme CFMP (Ref 11-10) considers all types of inland flooding, from rivers, ground water, surface water and tidal flooding, but not flooding directly from the sea (coastal flooding).
- 11.10.5 The CFMP splits the Grimsby and Ancholme catchment into 5 sub-areas which have similar physical characteristics, sources of flooding and level of risk. The most appropriate approach to managing flood risk for each of the sub-areas is identified and one of six generic flood risk management policies is allocated to the area.
- 11.10.6 The Project is located in sub-areas 1 and 4. Sub-area 1 identifies that flooding from rivers is the main source of flood risk in this area. The vision and preferred policy for this sub-area is Policy Option 2, where the preferred approach is to reduce bank and channel maintenance to help improve the flow between the river and its floodplain. Sub-area 4 identifies that flooding from rivers and tide-locked IDB watercourses is the main source of flood risk in this area. The vision and preferred policy for this sub-area is Policy Option 4, where the preferred approach is to conduct a flood risk study to investigate how further action can be taken to manage flood risk into the future.

Louth Coastal Catchment Flood Management Plan

- 11.10.7 The role of Catchment Flood Management Plans (CFMP) are to identify flood risk management policies which will assist all key decision makers in the catchment to deliver sustainable flood risk management for the long term. The Louth Coastal CFMP (Ref 11-11) considers all types of inland flooding, from rivers, ground water, surface water and tidal flooding, but not flooding directly from the sea (coastal flooding).
- 11.10.8 The CFMP splits the Louth Coastal catchment into 7 sub-areas which have similar physical characteristics, sources of flooding and level of risk. The most appropriate approach to managing flood risk for each of the sub-areas is identified and one of six generic flood risk management policies is allocated to the area.
- 11.10.9 The Project is located in sub-areas 3 and 5. Sub-area 3 identifies that flooding from embanked watercourses, due to defence failure is the main source of flood risk in this area. The vision and preferred policy for this sub-area is Policy Option 4, where the preferred approach is to store water upstream, along Waithe Beck, combined with an improvement of current maintenance activities. Sub-area 5 identifies that flooding from rivers is the main source of flood risk in this area. The vision and preferred policy for this sub-area is Policy Option 3, where the preferred approach is to continue with the current flood risk management activities in the short-term, but consider alternative, more appropriate ways to manage flood risk in the long term.

Flamborough Head to Gibraltar Point Shoreline Management Plan

- 11.10.10 The purpose of a Shoreline Management Plan is to identify the most sustainable approach to managing the flood and coastal erosion risks to the coastline in the short-term (0-20 years), medium term (20 to 50 years) and long term (50 to 100 years).
- 11.10.11 In the Flamborough Head to Gibraltar Point SMP (Ref 11-9), the Project falls into the following Policy Units:
- **Policy Unit L East Immingham to Cleethorpes:** preferred policy is to hold defences in their current position and their function will be maintained.

- **Policy Unit M Humberston Fitties:** preferred policy is to maintain the first line of defences at current crest levels and improve the second line of defence in the Chalet Park to counter potential sea level rise, up to 2055. Between 2055 to 2105, the second line of defences will be held in their current position and their function and the standard of protection against flooding will be maintained.
- **Policy Unit N South of Humberston Fitties to Theddlethorpe St Helen:** preferred policy is to hold the defences in their current position and their flood defence function will be maintained. Embankments may be raised and improved to counter sea level rise as required, to maintain the standard of protection.

11.11 Local Policy

11.11.1 The Project lies within the following administrative areas:

- North Lincolnshire Council (NLC);
- North East Lincolnshire Council (NELC);
- West Lindsey District Council (WLDC); and
- East Lindsey District Council (ELDC).

11.11.2 The local development plans for these areas, which EN-1 confirms may be ‘important and relevant’ in the determination of a DCO application, currently comprises the following documents:

- North Lincolnshire Council Local Development Framework (adopted 2011) (Ref 11-26);
- North East Lincolnshire Council Local Plan 2013 to 2032 (Adopted 2018) (Ref 11-24);
- North Kesteven District Council Central Lincolnshire Local Plan (Adopted 2017) (Ref 11-25); and
- East Lindsey District Council Local Plan (Adopted 2018) (Ref 11-8).

11.11.3 The North Lincolnshire Council Local Development Framework sets out the vision and overall development strategy for the Council’s area and how it will be achieved for the period 2006 until 2026. Specific policies are highlighted in **Table 11-10**.

Table 11-10: Relevant NLC Local Planning Policies

Document	Policy / Guidance
North Lincolnshire Council Local Development Framework	<p>Policy CS2: Delivering More Sustainable Development All future development in North Lincolnshire will be required to contribute towards achieving sustainable development. Developments should be constructed and operated using a minimum amount of non-renewable resources, including increasing the use of renewable energy in construction and operation.</p> <p>Policy CS18: Sustainable Resource Use and Climate Change The council will actively promote development that utilises natural resources as efficiently and sustainably as possible. This includes: Supporting the necessary improvement of flood defences and surface water infrastructure required against the actions of</p>

Document	Policy / Guidance
	<p>climate change and preventing development in high flood risk areas wherever practicable and possible.</p> <p>Meeting required national reductions of predicted CO2 emissions by at least 34% in 2020 and 80% in 2050 by applying the following measures on development proposals. Requiring all industrial and commercial premises greater than 1000 square metres to provide 20% of their expected energy demand from on-site renewable energy until the code for such buildings is applied nationally. Where developers consider these Codes and targets cannot be met on the basis of viability, they will be required to provide proof through open book discussions with the council at the planning application stage.</p> <p>Ensuring that development and land use in areas close to the Humber Estuary and rivers responds appropriately to the character of the area, in the interests of preserving and making best use of limited resources.</p> <p>Ensuring development and land use helps to protect people and the environment from unsafe, unhealthy and polluted environments, by protecting and improving the quality of the air, land and water.</p> <p>Supporting renewable sources of energy in appropriate locations, where possible, and ensuring that development maximises the use of combined heat and power, particularly at the South Humber Bank employment site and where energy demands for more than 2MW are required for development.</p> <p>Supporting new technology and development for carbon capture and the best available clean and efficient energy technology, particularly in relation to the heavy industrial users in North Lincolnshire, to help reduce CO2 emissions.</p> <p>Promote the use of a greenspace strategy and a green infrastructure plan, where applicable, which could help reduce the effects of climate change.</p> <p>Policy CS19: Flood Risk</p> <p>The council will support development proposals that avoid areas of current or future flood risk, which do not increase the risk of flooding elsewhere. This will involve a risk based sequential approach to determine the suitability of land for development that uses the principle of locating development, where possible, on land that has a lower flood risk, and relates land use to its vulnerability to flood.</p> <p>Development in areas of high flood risk will only be permitted where it meets the following prerequisites:</p> <p>It can be demonstrated that the development provides wider sustainability benefits to the community and the area that outweigh flood risk.</p> <p>The development should be on previously used land. If not, there must be no reasonable alternative developable sites on previously developed land.</p>

Document	Policy / Guidance
	<p>A flood risk assessment has demonstrated that the development will be safe, without increasing flood risk elsewhere by integrating water management methods into development.</p> <p>Development proposals in flood risk areas which come forward in the remainder of North Lincolnshire shall be guided by the Strategic Flood Risk Assessment for North Lincolnshire and Northeast Lincolnshire. This will ensure that proposals include site specific flood risk assessments which take into account strategic flood management objectives and properly apply the Sequential and, where necessary, Exception Tests.</p> <p>In addition, development will be required, wherever practicable, to incorporate Sustainable Urban Drainage Systems (SUDS) to manage surface water drainage. The Council will also seek to reduce the increase in flood risk due to climate change through measures to reduce carbon dioxide emissions.</p>

11.11.4 The North East Lincolnshire Council Local Plan sets out the vision and overall development strategy for the Council’s area and how it will be achieved for the period 2013 until 2032. Specific policies are highlighted in **Table 11-11**.

Table 11-11: Relevant NELC Local Planning Policies

Document	Policy / Guidance
<p>North East Lincolnshire Council Local Plan</p>	<p>Policy 33: Flood Risk</p> <p>Development proposals should have regard to the requirements of the flood risk sequential test and, if necessary, the exception test. The regeneration benefits of development in areas of high flood risk should also be considered in light of the Council's Guidance Note on the application of the Sequential and Exception Tests in North East Lincolnshire, and the Environment Agency's Standing Advice.</p> <p>In order to minimise flood risk impacts and mitigate against the likely effects of climate change, development proposals should demonstrate that:</p> <ul style="list-style-type: none"> Where appropriate, a site-specific flood risk assessment has been undertaken, which takes account of the best available information related to all potential forms of flooding; There is no unacceptable increased risk of flooding to the development site or to existing properties; The development will be safe during its lifetime; Sustainable Drainage Systems (SuDS) have been incorporated into the development unless their use has been deemed inappropriate; Opportunities to provide natural flood management and mitigation through green infrastructure have been assessed and justified, based upon sound evidence, and, where appropriate, incorporated, particularly in combination with delivery of other

Document	Policy / Guidance
	<p>aspects of green infrastructure in an integrated approach across the site;</p> <p>Arrangements for the adoption, maintenance and management of any mitigation measures have been established and the necessary agreements are in place;</p> <p>Access to any watercourse or flood defence asset for maintenance, clearance, repair or replacement is not adversely affected; and,</p> <p>The restoration, improvement or provision of additional flood defence infrastructure represents an appropriate response to local flood risk, and does not conflict with other Plan policies.</p> <p>Policy 34: Water Management</p> <p>Development proposals that have the potential to impact on surface and ground water should consider the objectives and programme of measures set out in the Humber River Basin Management Plan. Development proposals should consider how water will be used on the site and ensure that appropriate methods for management are incorporated into the design. Development proposals should demonstrate that:</p> <p>Adequate and sustainable water supplies are available to support the development proposed;</p> <p>Provisions are made for the efficient use of water, including reuse and recycling. Proposals for residential development will be expected to demonstrate that a water efficiency standard of 110 litres per person per day can be achieved; and</p> <p>Adequate foul water treatment already exists or can be provided in time to serve the development. Appropriate and sustainable sewerage systems should be provided for the collection and treatment of foul and surface water to ensure new development does not overload the existing sewerage infrastructure, minimising the need to discharge water into sewers, particularly combined sewers.</p> <p>Where development is proposed within a Source Protection Zone, the potential for any risk to groundwater resources and groundwater quality must be assessed and it must be demonstrated that these would be protected throughout the construction and operational phase of development.</p>

11.11.5 The Central Lincolnshire Local Plan sets out the vision and overall development strategy for the Council’s area and how it will be achieved for the period 2012 until 2036. Specific policies are highlighted in **Table 11-12**.

Table 11-12: Relevant Central Lincolnshire Local Planning Policies

Document	Policy / Guidance
Central Lincolnshire Local Plan	<p>Policy LP1: A Presumption in Favour of Sustainable Development</p> <p>At the heart of the strategy for Central Lincolnshire is a desire to deliver sustainable growth. When considering development</p>

Document	Policy / Guidance
	<p>proposals, the Central Lincolnshire districts of West Lindsey, Lincoln City and North Kesteven will take a positive approach that reflects the presumption in favour of sustainable development contained in the National Planning Policy Framework. The districts will always work proactively with applicants to find solutions which mean that proposals can be approved wherever possible, and to secure development that improves the economic, social and environmental conditions in Central Lincolnshire.</p> <p>Policy LP14: Managing Water Resources and Flood Risk</p> <p>All development proposals will be considered against the NPPF, including application of the sequential and, if necessary, the exception test.</p> <p>Through appropriate consultation and option appraisal, development proposals should demonstrate:</p> <ul style="list-style-type: none"> • That they are informed by and take account of the best available information from all sources of flood risk and by site specific flood risk assessments where appropriate; • That there is no unacceptable increased risk of flooding to the development site or to existing properties; • That the development will be safe during its lifetime, does not affect the integrity of existing flood defences and any necessary flood mitigation measures have been agreed with the relevant bodies; • That the adoption, ongoing maintenance and management of any mitigation measures have been considered and any necessary agreements are in place; • How proposals have taken a positive approach to reducing overall flood risk and have considered the potential to contribute towards solutions for the wider area; and • That they have incorporated Sustainable Drainage Systems (SuDS) into the proposals unless they can be shown to be impractical. <p>Development proposals that are likely to impact on surface or ground water should consider the requirements of the Water Framework Directive.</p> <p>Policy LP18: Climate Change and Low Carbon Living</p> <p>Development proposals will be considered more favourably if the scheme would make a positive and significant contribution towards one or more of the following (which are listed in order of preference):</p> <ul style="list-style-type: none"> • Reducing demand: by taking account of landform, location, layout, building orientation, design, massing and landscaping, development should enable occupants to minimise their energy and water consumption, minimise their need to travel and, where travel is necessary, to maximise opportunities for sustainable modes of travel; • Resource efficiency: development should (a) take opportunities to use sustainable materials in the construction

Document	Policy / Guidance
	<p>process, avoiding products with a high embodied energy content; and (b) minimise construction waste;</p> <ul style="list-style-type: none"> • Energy production: development could provide site based decentralised or renewable energy infrastructure. The infrastructure should be assimilated into the proposal through careful consideration of design. Where the infrastructure may not be inconspicuous, the impact will be considered against the contribution it will make; • Carbon off-setting: development could provide extensive, well designed, multi-functional woodland (and, if possible, include a management plan for the long term management of the wood resource which is produced), fenland or grassland. The Central Lincolnshire Biodiversity Opportunity Mapping (or subsequent relevant document) should be used to guide the most suitable habitat in a particular area. <p>Proposals which address one or more of the above principles (whether in relation to an existing development or as part of a wider new development scheme) which are poorly designed and/or located and which have a detrimental impact on the landscape, the amenity of residents, or the natural and built environment, will be refused.</p>

11.11.6 The East Lindsey District Council Core Strategy sets out the vision and overall development strategy for the Council’s area and how it will be achieved up to 2031. Specific policies are highlighted in **Table 11-13**.

Table 11-13: Relevant ELDC Local Planning Policies

Document	Policy / Guidance
<p>East Lindsey District Council Core Strategy</p>	<p>Strategic Policy 2: Sustainable Development</p> <p>When considering development proposals the Council will take a positive approach that reflects the presumption in favour of sustainable development contained in the National Planning Policy Framework. It will always work proactively with applicants jointly to find solutions which mean that proposals can be approved wherever possible, and to secure development that improves the economic, social and environmental conditions in the area. Planning applications that accord with the policies in this Local Plan (and, where relevant, with policies in neighbourhood plans) will be approved without delay, unless material considerations indicate otherwise.</p> <p>Strategic Policy 16: Inland Flood Risk</p> <p>The Council will support development for business, leisure and commercial uses in areas of inland flood risk where it can be demonstrated that accommodating the development on a sequentially safer site would undermine the overall commercial integrity of the existing area. Such developments must incorporate flood mitigation measures in their design. The Council will not support development in identified flood storage areas. All new development must show how it proposes to provide adequate surface water disposal, including avoiding impacting on surface</p>

Document	Policy / Guidance
	<p>water flow routes or ordinary watercourses. The Council will expect this to involve the use of Sustainable Urban Drainage Systems along with other appropriate design features, including the retention of any existing water features on a site. Surface water connections to the combined or surface water system should only be made in exceptional circumstances where it can be demonstrated that there are no feasible alternatives and where there is no detriment to existing users. The Council will support improvements to the existing flood defences, the creation of new flood defences, infrastructure associated with emergency planning, washlands and flood storage areas. Where required by national planning policy development proposals in areas at risk of flooding must be accompanied by a site-specific flood risk assessment.</p> <p>Strategic Policy 17: Coastal East Lindsey</p> <p>The coastal policy applies to the following settlements: Addlethorpe, Anderby, Chapel St Leonards, Croft, Ingoldmells, Mablethorpe, New Leake, North Cotes, North Somercotes, Saltfleetby All Saints, Saltfleetby St Clements, Saltfleetby St Peter, Skegness, Skidbrook cum Saltfleet, South Somercotes, Sutton on Sea, Theddlethorpe All Saints, Theddlethorpe St Helen and Trusthorpe. The Council will give a high priority to development that extends and diversifies all-year round employment opportunities, contributes directly to the local economy, infrastructure or extends and diversifies the tourism market. The Council will support improvements to the existing flood defences, the creation of new flood defences and infrastructure associated with emergency planning. Development will need to demonstrate that it satisfies the Sequential and Exception Test as set out in Annex 2 of this Plan. All relevant development will need to provide adequate flood mitigation.</p> <p>Strategic Policy 27: Renewable and Low Carbon Energy</p> <p>Large-scale renewable and low carbon energy development, development for the transmission and interconnection of electricity, and infrastructure required to support such development, will be supported where their individual or cumulative impact is, when weighed against the benefits, considered to be acceptable. Water environment and water quality is one of these impacts.</p> <p>Strategic Policy 28: Infrastructure</p> <p>Infrastructure schemes will be supported provided they are essential in the national interest; contribute to sustainable development and respect the distinctive character of the district. Infrastructure schemes should be accompanied by an impact assessment that shows how the proposal impacts on the landscape or local setting of the area, including individual and cumulative effects. It should identify what steps have been taken to minimize its effects and the alternative options that have been considered. The Council will support the delivery of infrastructure where it contributes to sustaining local communities. The Council will only support proposals for development where it has been shown that adequate capacity is available or can be provided by the utility</p>

Document	Policy / Guidance
	providers to meet the additional loads associated with serving the development.

11.12 Other Relevant Policy and Guidance

Local Flood Risk Management Strategies

11.12.1 The following strategies cover the pipeline route:

- North Lincolnshire Council Local Flood Risk Management Strategy (Ref 11-28);
- North East Lincolnshire Local Flood Risk Management Strategy (Ref 11-23); and
- Lincolnshire County Council Joint Lincolnshire Flood Risk and Water Management Strategy (Ref 11-19).

11.12.2 The vision of the NLC LFRMS is “to provide the necessary framework for fostering partnerships between Flood Risk Management Partners, particularly in delivering flood risk management schemes”. The vision of the NELC LFRMS is “to identify the areas where we expect to face the greatest flood risks now and in the future to build resilience with the community to be better prepared for flooding”. The vision of the Joint Lincolnshire Flood Risk and Water Management Strategy is “to manage the impact of flood risk to people, businesses and the environment across Lincolnshire”.

11.12.3 Each of the strategies assess local flood risk (from surface water, groundwater and ordinary watercourses) within the boroughs and set objectives for managing the risk. The strategies detail mechanisms for achieving the objectives and seeks to reduce the risk of flooding.

Strategic Flood Risk Assessments

11.12.4 A Strategic Flood Risk Assessment (SFRA) provides the central source of all relevant flood risk information. An SFRA is required to initiate the sequential risk-based approach to the allocation of land for development in the Council’s Local Plans and to identify whether the application of the Exception Test is likely to be necessary.

11.12.5 The North and North East Lincolnshire (Ref 11-29) and East Lindsey (Ref 11-7) SFRA’s indicate that the majority of flood risk in the region comes from the sea and tidal estuary, with the greatest risk developing when meteorological conditions create a surge to the tide. Tide locking (prevention of fluvial flow discharging due to high tide levels) is also a contributing flood risk factor on many watercourses that flow into the River Humber or North Sea. The West Lindsey SFRA (Ref 11-30) indicates that the majority of flood risk in this region comes from the overflowing of watercourses.

Preliminary Flood Risk Assessments

11.12.6 In their roles as LLFAs, NLC, NELC and LCC (Ref 11-27; Ref 11-22 and Ref 11-17) have produced Preliminary Flood Risk Assessment (PFRA) reports to meet their statutory duties to manage local flood risk and deliver the requirements of the Flood Risk Regulations 2009. The Regulations require LLFAs, through the PFRA process, to determine whether there is a significant risk in their area based on local flooding (surface water, groundwater, ordinary watercourses and canals) and identify the part of the area affected by these risks.

11.12.7 The purpose of a PFRA report is to provide a strategic assessment of flood risk from local sources including surface water, groundwater, ordinary watercourses and canals. The reports are high-level exercises using readily available data held by the Councils and partnering organisations. The reports look at historical flood events and consider the

potential future flood events that may have a significant consequence on human health, economic activity and the environment including cultural heritage.

Lincolnshire County Local Standards for Sustainable Drainage

- 11.12.8 The Lincolnshire County Council Sustainable Drainage Design and Evaluation Guide (Ref 11-18) has been produced by a working group of 16 local authorities across England. This document forms the local standards for the Local Authorities and, together with the National Standards, strongly promotes the use of SuDS which help to reduce surface water runoff and mitigate flood risk.
- 11.12.9 The document indicates the minimum standards to ensure a satisfactory scheme is constructed under the Flood and Water Management Act 2010 (FMWA), although they are not intended to preclude any requirement for a higher standard that may be deemed necessary. Adherence to the standards set out in the document will ensure that the Local Authority is willing to maintain the new systems on completion.
- 11.12.10 Local principles and requirements include:
1. The developer should consider all sources of flood risk both to and from the proposed development, and good sustainable drainage solutions, as an integrated design approach. Lincolnshire County Council, as highway and lead local flood authority (HFA), will then provide a combined response in line with its statutory duties;
 2. The distribution and layout of buildings and infrastructure on site can greatly influence the potential for creating flood pathways and affect flood risk to property. A number of hierarchical key stages and steps should be taken to reflect the principles and strategic objectives of the development and establish appropriate infrastructure prior to proceeding to the outline and detailed design stages; and
 3. Early consideration of infrastructure requirements is essential, and close discussion with potential adopting authorities is necessary to guide integrated planning and ensure effective ongoing maintenance arrangements.

Building Standards Regulations 2000 Part H

- 11.12.11 The Building Standards Regulations 2000 Part H (Ref 11-33) requires that surface water runoff be preferentially discharged first to soakaway, then to surface watercourse and finally to sewer.

11.13 Flood Risk Sources

- 11.13.1 The NPPF requires the effects of all forms of flood risk, both to and from the Project, are considered within this PFRA. There should be demonstration of how these should be managed so that the development remains safe throughout its lifetime, taking into account climate change.

11.14 Historical Flooding Incidents

- 11.14.1 The EA and LLFAs have not provided details of historical flooding incidents in consultation to date. Records of historical flooding will be obtained from the EA, LLFAs and Anglian Water during further consultation to be undertaken at the next assessment stage.

11.15 Tidal Sources

- 11.15.1 Tidal flooding occurs during extreme high tide and/or storm surge events which cause wave overtopping or the unlikely event of a breaching scenario of existing tidal defences. High water levels within tidally influenced estuaries and rivers may also contribute to tidal

flooding. As a consequence of climate change, sea level rises and increased storm surges are predicted, increasing the probability of flooding from overtopping or breach on tidal watercourses and at the coast. The key source of data for tidal flooding is the EA flood Map for Planning (Ref 11-14) and any consultation data the EA provide during the next phase of assessment,

- 11.15.2 The Project is situated in a coastal location. Section 1 of the Draft Order Limits is located between 1.5km and 4km from the Humber Estuary and Section 5 of the pipeline is located between 1.5km and 8.5km from the North Sea. The EA's Flood Map for Planning (Ref 11-14) identifies that Sections 1 and 5 of the Draft Order Limits lie within the tidal extent of Flood Zones 2 (0.1-0.5% AEP) and 3 (>1% AEP). Sections 2, 3 and 4 of the pipeline are not at risk of flooding from tidal sources. Given the proximity to the sea, it is likely that the watercourses crossing the pipeline are tidally influenced. This would be confirmed during consultation with the EA at the next stage.
- 11.15.3 EA mapping shows flood defences along the entire stretch of coastline from Immingham to Theddlethorpe, which comprise a variety of coastal defences including sand dunes and hard engineered defences. The key tidal flood risk associated with the Project is breaching or overtopping of the flood defences. The tidal flood extents shown on the EA mapping do not indicate that the Project areas within the tidal flood plain are protected by defences, likely associated with the risk of overtopping or breaching of these defences.
- 11.15.4 More detailed extreme water level and flood defence data will be requested from the EA during consultation and assessed during the full EIA.
- 11.15.5 The proposed pipeline route would be below ground across its entire route. During operation, the risk of tidal flooding to and from the development would therefore be low. During construction, there is a risk of flooding to the construction site and of displacing floodwater. To mitigate this risk, appropriate construction management practices will need to be adhered to, such as minimising work in the floodplain, not storing materials/plant in the floodplain, and adoption of an appropriate Flood Warning and Evacuation Plan (FWEP).
- 11.15.6 Any proposed above ground assets (excluded from this PFRA) located in the design tidal floodplain have the potential to displace floodwater and would therefore require compensation/mitigation.

11.16 Fluvial Sources

- 11.16.1 Fluvial flooding occurs when the capacity of a river is exceeded whether due to high flows from the catchment draining into the river or a combination of high flows and high tides, which causes raised water levels due to backwater effects. The key source of data for fluvial flooding is the EA Flood Map for Planning (Ref 11-14).
- 11.16.2 Sections 1 and 2 of the Draft Order Limits predominantly crosses ordinary watercourses maintained by North-East Lindsey IDB and is not in proximity to any main rivers. Sections 3, 4 and 5 of the Draft Order Limits cross numerous main rivers and ordinary watercourses, some of which are maintained by Lindsey Marsh IDB.
- 11.16.3 Several unnamed land drains are also crossed throughout the route. The EA's Flood Map for Planning (Environment Agency, 2022a) identifies Flood Zones 2 (0.1-0.5% AEP) and 3 (>1% AEP) extents associated with all of the Main River and Ordinary Watercourse crossings. The named watercourse crossings are listed in **Table 11-2**, with a full crossing schedule provided as an Appendix to *PEIR Volume II - Chapter 11: Water Environment*.
- 11.16.4 The Draft Order Limits cross a complex network of drains associated with the tidal/estuary nature of the area.

- 11.16.5 Given the proximity to the sea, it is likely that the watercourses crossing the pipeline are also tidally influence. This would be confirmed during consultation with the EA at the next stage.
- 11.16.6 Flood defence data and modelled fluvial water levels for the Main Rivers will be requested from the Environment Agency during consultation. Information about the IDB watercourses will be requested from the relevant IDB, and information around the remainder of impacted watercourses will be requested from ELDC and NELC in their role as LLFAs.
- 11.16.7 The proposed pipeline would be below ground across its entire route. The pipeline would be directed below existing watercourses and ditches using directional drilling such that existing flows are not impacted. During construction, there is a risk of flooding to the construction site and of displacing floodwater. To mitigate this risk, appropriate construction management practices will need to be adhered to, such as minimising work in the floodplain, not storing materials/plant in the floodplain, and adoption of an appropriate FWEP.
- 11.16.8 Any proposed above ground assets (excluded from this PFRA) located in the design fluvial floodplain have the potential to displace floodwater and would therefore require compensation/mitigation.

11.17 Groundwater Sources

- 11.17.1 As described in section 11.5.6, the Draft Order Limits cross superficial deposits consisting of Tidal Flats (clay and silt), Lacustrine Deposits, Alluvium Deposits and Devensian Till (Diamicton), which are defined as Secondary Undifferentiated aquifers. The entire route lies upon bedrock of the Burnham Chalk Formation, a principal aquifer. There is therefore the potential for elevated groundwater beneath the site.
- 11.17.2 The direct impact of climate change on groundwater resources is dictated by the changes in rainfall intensity and soil infiltration. During drier seasons, there may be reductions in groundwater recharge that may cause a long-term decline in groundwater storage. Alternatively, groundwater recharge may be stabilised or even increased by frequent and prolong periods of rainfall.
- 11.17.3 Borehole data will be obtained from the EA during consultation to infer groundwater levels across the Draft Order Limits. The groundwater levels beneath the site should also be assessed with ground investigations at a later stage.
- 11.17.4 The proposed pipeline route would be below ground across its entire route and therefore has the potential to encroach within the groundwater table. The pipeline will need to be designed appropriately to take into account the floatation risk to the pipe from elevated groundwater. Should the pipeline encroach within an aquifer, groundwater would be able to flow around the pipeline, such that the risk of displacing groundwater elsewhere is low. Appropriate construction practices will need to be adhered to manage the risk of groundwater ingress into excavations during construction, such as dewatering and pumping techniques as required.

11.18 Surface Water (Pluvial)

- 11.18.1 Surface water flooding is caused by overland flow that results from rainfall that fails to drain into the ground through infiltration, instead of travelling over the ground surface. Pluvial flooding can occur in urban areas during extreme, high intensity, low duration rainfall events which overwhelm the local surface water drainage systems, or in rural areas during medium intensity, long duration events where saturated ground conditions prevent infiltration into the subsoil. The Environment Agency Risk of Flooding from Surface Water

Maps (Ref 11-16) indicate areas at risk from surface water flooding where floodwater would be conveyed via overland flow routes dictated by topography.

- 11.18.2 The PPG defines the design return period for pluvial flooding as the 1% AEP plus climate change allowance. Whilst the EA surface water maps do not include an allowance for climate change, the extreme 0.1% AEP flood extents give an indication of the increases in flooding that could occur as a result of climate change.
- 11.18.3 The proposed pipeline route is predominantly at very low risk of flooding from surface water (<0.1% AEP), with parts of the route crossing low (0.1%-1% AEP), medium (1%-3.3% AEP) and high risk (>3.3% AEP) areas. The main pluvial flow routes coincide with watercourses and ditches as discussed previously in this report. There are also isolated pockets of pluvial ponding, which are considered to be reflective of areas of low topography.
- 11.18.4 The PPG defines the design return period for pluvial flooding as the 1% AEP plus climate change allowance. Whilst the Environment Agency surface water maps don't include an allowance for climate change, the extreme 0.1% AEP flood extents give an indication of the increases in flooding that could occur as a result of climate change. As the pipeline would be buried, should existing ground levels be retained then there will be no requirement for a drainage strategy as rainfall will be conveyed as per the existing scenario.
- 11.18.5 The proposed pipeline route would be below ground across its entire route. The risk to and from watercourses has been covered within the 'fluvial' section of this report. During operation, it is assumed that existing ground levels would be retained above the proposed pipeline, therefore there would be no impact on pluvial flood risk. Appropriate construction practices will need to be adhered to manage the risk of surface water ingress into excavations during construction, such as temporary drainage provisions and pumping as required.
- 11.18.6 Any proposed above ground assets (excluded from this PFRA) located at risk of surface water flooding have the potential to displace floodwater and would therefore require compensation/mitigation.

11.19 Artificial Waterbodies

- 11.19.1 Artificial waterbodies include raised channels such as canals or storage features such as ponds, canals and reservoirs. It should be noted that many of the watercourses (covered in the 'fluvial' section of this report) are artificial or heavily modified.
- 11.19.2 Section 2 of the Draft Order Limits is at risk of flooding from reservoirs upstream on the Laceby Beck, however the majority of the Draft Order Limits is not at risk of flooding from artificial sources.
- 11.19.3 It should be noted that the EA map indicates the largest area that may be affected by flooding if a reservoir were to fail. The EA note that this is a worst-case prediction, and any flood event is unlikely to be this large. Although the consequences of a sudden embankment failure would be severe, the probability of this occurring is extremely low. All large, raised reservoirs must be inspected and supervised by reservoir panel engineers under the Reservoirs Act 1975, such that essential maintenance and safety work is carried out. This ensure that the embankments are maintained to a high standard, reducing the associated risk.
- 11.19.4 The proposed pipeline route would be below ground across its entire route. During operation, the risk of artificial flooding to and from the Project would therefore be low. During construction, there is a risk of flooding to the construction site. To mitigate this risk, a FWEP should be put in place to include provisions for the event of a reservoir breach/failure.

11.20 Summary of Flood Risk

- 11.20.1 **Table 11-14** summarises the risk of flooding to and from the Project and sets out the likely measures required to mitigate the identified risk. The mitigation measures would be confirmed and refined at the next stage of assessment, once more detailed proposals are available.
- 11.20.2 This PFRA only assesses the pipeline route itself, which is assumed to be below ground across the entire route including at watercourse crossings. Any associated above ground structures have not been assessed at this stage.

Table 11-14: Summary of Flood Risk Sections 1 - 5

Section	Flood Risk Source	Flood Risk Summary	Mitigation
1	Tidal	The first ~2.26 km stretch of the Draft Order Limits lies within Flood Zones 2 and 3, at risk of flooding from the tidal River Humber.	Operation Phase: None as pipeline is below ground. Construction Phase: Non-intrusive crossing of watercourses, and appropriate construction management practices including FWEP.
	Fluvial	The main risk of flooding to this section is tidal rather than fluvial. This section of the Draft Order Limits is not in proximity to any Main Rivers. The Draft Order Limits cross the Haborough Marsh Drain (IDB Watercourse) and several unnamed land drains, some of which are managed by North-East Lindsey IDB.	Operation Phase: None as pipeline is below ground. Construction Phase: Non-intrusive crossing of watercourses, and appropriate construction management practices including FWEP.
	Groundwater	Potential for elevated groundwater: superficial deposits consist of Tidal Flats (clay and silt) and Devensian Till (Diamicton). Bedrock consists of Burnham Chalk Formation which is a principal aquifer.	Operation Phase: Pipeline to be built to withstand hydrostatic pressure and potential for flotation. Construction Phase: Appropriate construction management practices including pumping as required.
	Surface Water	The majority of this section of the Draft Order Limits is at low risk of flooding from surface water, with isolated areas at medium and high risk. It is considered that these	Operation phase: None as pipeline is below ground. Construction Phase: Appropriate

Section	Flood Risk Source	Flood Risk Summary	Mitigation
		areas shown to be at risk are reflective of areas of low topography. The pluvial flow routes present on EA mapping are considered to be associated with watercourses and drains as assessed in the 'fluvial' section.	construction management practices including temporary drainage and pumping as required.
	Artificial Waterbodies	There are no artificial waterbodies, including reservoirs and canals, in proximity to this section of the Draft Order Limits and it is located outside of the EA reservoir breach flood extents. However, it should be noted that many of the watercourses (covered in the 'fluvial' section) are artificial or heavily modified.	Operation phase: None. Construction Phase: None.
2	Tidal	Due to the proximity to the sea, the watercourses which cross this section of the Draft Order Limits could be tidally influenced (to be confirmed at the next stage in consultation with the EA).	Operation Phase: None as pipeline is below ground. Construction Phase: Non-intrusive crossing of watercourses, and appropriate construction management practices including FWEP.
	Fluvial	This section of the Draft Order Limits is not in proximity to any Main Rivers. The Draft Order Limits cross the IDB managed stretches of North Beck Drain and Oldfleet Drain that lie in Flood Zones 2 and 3. The Draft Order Limits also cross several unnamed land drains.	Operation Phase: None as pipeline is below ground. Construction Phase: Non-intrusive crossing of watercourses, and appropriate construction management practices including FWEP.
	Groundwater	Potential for elevated groundwater: superficial deposits consist of Tidal Flats (clay and silt), Devensian Till, Sand and Gravel (Diamicton). Bedrock consists of Burnham Chalk Formation which is a principal aquifer.	Operation Phase: Pipeline to be built to withstand hydrostatic pressure and potential for flotation. Construction Phase: Appropriate construction management practices

Section	Flood Risk Source	Flood Risk Summary	Mitigation
			including pumping as required.
	Surface Water	The majority of this section of the Draft Order Limits is at low risk of flooding from surface water, with isolated areas at medium and high risk. It is considered that these areas shown to be at risk are reflective of areas of low topography. The pluvial flow routes present on EA mapping are considered to be associated with watercourses and drains as assessed in the 'fluvial' section.	Operation phase: None as pipeline is below ground. Construction Phase: Appropriate construction management practices including temporary drainage and pumping as required.
	Artificial Waterbodies	There is a risk of flooding from reservoirs, upstream on the Laceby Beck. However, it should be noted that many of the watercourses are artificial or heavily modified.	Operation phase: None as pipeline is below ground. Construction Phase: FWEP.
3	Tidal	Due to the proximity to the sea, the watercourses which cross this section of the Draft Order Limits could be tidally influenced (to be confirmed at the next stage in consultation with the EA).	Operation Phase: None as pipeline is below ground. Construction Phase: Non-intrusive crossing of watercourses, and appropriate construction management practices including FWEP.
	Fluvial	This section of the Draft Order Limits crosses the Laceby Beck (IDB Watercourse), Waithe Beck (Main River) and Black Leg Drain (Ordinary Watercourse) which cross Flood Zones 2 and 3. The Draft Order Limits also crosses several unnamed land drains.	Operation Phase: None as pipeline is below ground. Construction Phase: Non-intrusive crossing of watercourses, and appropriate construction management practices including FWEP.
	Groundwater	Potential for elevated groundwater: superficial deposits consist of Tidal Flats (clay and silt), Devensian Till, Sand and Gravel (Diamicton), Lacustrine and Alluvium Deposits. Bedrock consists of Burnham	Operation Phase: Pipeline to be built to withstand hydrostatic pressure and potential for flotation. Construction Phase: Appropriate

Section	Flood Risk Source	Flood Risk Summary	Mitigation
		Chalk Formation which is a principal aquifer.	construction management practices including pumping as required.
	Surface Water	The majority of this section of the Draft Order Limits is at low risk of flooding from surface water, with isolated areas at medium and high risk. It is considered that these areas shown to be at risk are reflective of areas of low topography. The pluvial flow routes present on EA mapping are considered to be associated with watercourses and drains as assessed in the 'fluvial' section.	Operation phase: None as pipeline is below ground. Construction Phase: Appropriate construction management practices including temporary drainage and pumping as required.
	Artificial Waterbodies	There are no artificial waterbodies, including reservoirs and canals, in proximity to this section of the Draft Order Limits and it is located outside of the EA reservoir breach flood extents. It should be noted that many of the watercourses (covered in the 'fluvial' section) are artificial or heavily modified.	Operation phase: None. Construction Phase: None.
4	Tidal	Due to the proximity to the sea, the watercourses which cross this section of the Draft Order Limits is not at risk of flooding from tidal sources.	Operation Phase: None as pipeline is below ground. Construction Phase: Non-intrusive crossing of watercourses, and appropriate construction management practices including FWEP.
	Fluvial	This section of the Draft Order Limits crosses Poulton Drain (Ordinary Watercourse), Yarborough Beck (Ordinary Watercourse), Louth Canal (Main River), Lower River Lud (Main River), Green Dike (Ordinary Watercourse), Harrowsea Drain (Ordinary Watercourse) and Grayfleet Drain (Main River) which lie in Flood Zones 2 and 3. The	Construction Phase: Evacuation Plan, including the removal of construction materials from the floodplain

Section	Flood Risk Source	Flood Risk Summary	Mitigation
		Draft Order Limits also cross several unnamed land drains.	
	Groundwater	Potential for elevation groundwater: superficial deposits consist of Tidal Flats (clay and silt), Devensian Till, Sand and Gravel (Diamicton), Lacustrine and Alluvium Deposits. Bedrock consists of Burnham Chalk Formation which is a principal aquifer.	<p>Operation Phase: Pipeline to be built to withstand hydrostatic pressure and potential for flotation.</p> <p>Construction Phase: Appropriate construction management practices including pumping as required.</p>
	Surface Water	The majority of this section of the Draft Order Limits is at low risk of flooding from surface water, with isolated areas at medium and high risk. It is considered that these areas shown to be at risk are reflective of areas of low topography. The pluvial flow routes present on EA mapping are considered to be associated with watercourses and drains as assessed in the 'fluvial' section.	<p>Operation phase: None as pipeline is below ground.</p> <p>Construction Phase: Appropriate construction management practices including temporary drainage and pumping as required.</p>
	Artificial Waterbodies	There are no artificial waterbodies, including reservoirs and canals, in proximity to this section of the Draft Order Limits and it is located outside of the EA reservoir breach flood extents. It should be noted that many of the watercourses (covered in the 'fluvial' section) are artificial or heavily modified.	<p>Operation phase: None.</p> <p>Construction Phase: None.</p>
5	Tidal	This section of the Draft Order Limits lies entirely within Flood Zones 2 and 3, at risk of flooding from the River Humber.	<p>Operation Phase: None as pipeline is below ground.</p> <p>Construction Phase: Non-intrusive crossing of watercourses, and appropriate construction management practices including FWEP.</p>

Section	Flood Risk Source	Flood Risk Summary	Mitigation
	Fluvial	This section of the Draft Order Limits crosses Sykes Drain (Ordinary Watercourse), Long Eau (Main River), The Cut Drain (Ordinary Watercourse), Two Mile Bank Drain (Ordinary Watercourse), Gayton North Fen Drain (Ordinary Watercourse), Old Engine Drain (Ordinary Watercourse), Great Eau (Main River), The Cut (Ordinary Watercourse) which cross Flood Zones 2 and 3. The Draft Order Limits also crosses several unnamed land drains.	<p>Operation Phase: None as pipeline is below ground.</p> <p>Construction Phase: Non-intrusive crossing of watercourses, and appropriate construction management practices including FWEP.</p>
	Groundwater	Potential for elevated groundwater: superficial deposits consist of Tidal Flats (clay and silt). Bedrock consists of Burnham Chalk Formation which is a principal aquifer.	<p>Operation Phase: Pipeline to be built to withstand hydrostatic pressure and potential for flotation.</p> <p>Construction Phase: Appropriate construction management practices including pumping as required.</p>
	Surface Water	The majority of this section of pipeline is at low risk of flooding from surface water, with isolated areas at medium and high risk. It is considered that these areas shown to be at risk are reflective of areas of low topography. The pluvial flow routes present on EA mapping are considered to be associated with watercourses and drains as assessed in the 'fluvial' section.	<p>Operation phase: None as pipeline is below ground.</p> <p>Construction Phase: Appropriate construction management practices including temporary drainage and pumping as required.</p>
	Artificial Waterbodies	There are no artificial waterbodies, including reservoirs and canals, in proximity to this section of the Draft Order Limits and it is located outside of the EA reservoir breach flood extents. It should be noted that many of the watercourses (covered in the 'fluvial' section) are artificial or heavily modified.	<p>Operation phase: None.</p> <p>Construction Phase: None.</p>

11.20.3 This PFRA has set out the flood risk to and from the Project and provides an indication of the likely mitigation measures that will need to be incorporated to ensure that flood risk to the site is managed and that flood risk is not increased elsewhere. The next stage of assessment (full FRA) will include further consultation with the Environment Agency, LLFAs, IDB, and Anglian Water.

11.21 Summary and Conclusions

11.21.1 This PFRA has demonstrated that, while there are significant gaps and further consultation is required with LLFAs, the EA and IDBs, the flood risk impacts to and from the Project can be mitigated and no significant impacts have been identified.

11.22 References

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