VikingCCS

Viking CCS Pipeline

Environmental Statement Volume II - Chapter 11: Water Environment

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Table of Contents

Figures

Tables

11 Water Environment

11.1 Introduction

11.1.1 This chapter of the Environmental Statement (ES) presents the assessment of the likely significant effects of the Viking CCS Pipeline (hereafter referred to as the Proposed Development) on the surface water environment (including inland, transitional and coastal surface waters) during construction, operation and decommissioning. The assessment includes consideration of impacts to surface water quality, water resources, hydromorphology, flood risk and drainage.

11.1.2 The surface water environment is interrelated with other environmental effects and so this chapter should be read in conjunction with *ES Volume II (Application Document 6.2)*:

- *Chapter 6: Ecology and Biodiversity*; and
- *Chapter 9: Geology and Hydrogeology*, which assesses impacts to groundwater.

11.1.3 This chapter is supported by Figures 11-1 to 11-16 (with higher resolution of these figures also presented within *ES Volume III (Application Document 6.3*) and additional information contained in the following appendices within *ES Volume IV (Application Document 6.4):*

- Appendix 11.1: Water Environment Baseline Supporting Information;
- Appendix 11.2: Site Visit Technical Note;
- Appendix 11.3: Drainage Strategy;
- Appendix 11.4: Water Framework Directive Assessment;
- Appendix 11.5: Flood Risk Assessment; and
- Appendix 11.6: Outline Water Management Plan.

11.2 Legislation, Policy and Guidance

Introduction

11.2.1 The Legislation, Policy and Guidance section of this chapter provides an overview of the relevant legislation, planning policy and technical guidance relevant to the water environment assessment.

Legislation

11.2.2 The potential impact of the Proposed Development on the water environment is considered in relation to the following national legislation:

- Environment Act 2021 (Ref 11-1);
- Water Act 2014 (Ref 11-2);
- Flood and Water Management Act, 2010 (Ref 11-3);
- Environment Act 1995 (Ref 11-4);
- Land Drainage Act 1991 (Ref 11-5);
- Water Resources Act 1991 (Ref 11-6);
- Environmental Protection Act 1990 (Ref 11-7);

- Salmon and Freshwater Fisheries Act 1975 (Ref 11-8);
- Control of Pollution Act 1974 (Ref 11-9);
- Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref 11-10);
- Environmental Permitting (England and Wales) Regulations 2016 (Ref 11-11);
- Environmental Damage (Prevention and Remediation) Regulations 2015 (Ref 11-12);
- Flood Risk Regulations 2009 (Ref 11-13);
- Eels (England and Wales) Regulations 2009 (Ref 11-14);
- Control of Substances Hazardous to Health Regulations 2002 (Ref 11-16); and
- Control of Pollution (Oil Storage) (England) Regulations 2001 (Ref 11-17).

National Planning Policy

11.2.3 National Planning Policy relevant to the water environment is detailed in **Table 11-1**. An overview of how relevant national planning policy has been complied with is provided within the *Planning Statement (Application Document 7.1)*.

Table 11-1: National Planning Policy Relevant to the Water Environment

Policy Reference	Policy Context
National Policy Statements (NPS)	
Overarching NPS for Energy (EN-1) (Ref 11-18)	National Policy Statements (NPS) for energy infrastructure were designated under the Planning Act 2008. The Overarching NPS for Energy (EN-1) published by The Department of Energy and Climate Change (now the Department for Energy Security and Net Zero (DESNZ)) in 2023. A revised (draft) Overarching NPS for Energy has recently been published in March 2023. This sets out the Government's policy for delivery of major energy infrastructure. Section 5.15 of this NPS covers water quality and recourses and states that: • *"Where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment as part of the ES or equivalent."*
Revised (draft) Overarching NPS EN-1 (Ref 11-19)	The relevant sections to this assessment with the main section being: Section 4.9: Climate Change Adaptation. This sector advises that the resilience of a project to climate change should be assessed in the ES as: • *"applicants for new energy infrastructure have taken into account the potential impacts of climate change using the latest UK Climate Projections and associated research and expert guidance (such as the EA's Climate Change Allowances for Flood Risk Assessments) available at the time the ES was prepared to ensure they have identified appropriate mitigation or adaptation*

Policy Reference	Policy Context
	measures. This should cover the estimated lifetime of the new infrastructure." Section 5.16.2: Water Quality and Resources, states that: • *"Where the Proposed Development is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment as part of the ES or equivalent"* Paragraph 5.16.5 provides advice on what the ES should describe in the baseline, stating that: ○ *"the existing quality of waters affected by the proposed project and the impacts of the proposed project on water quality, noting any relevant existing discharges, proposed new discharges and proposed changes to discharges.* ○ *existing physical characteristics of the water environment (including quantity and dynamics of flow) affected by the proposed project and any impact of physical modifications to these characteristics* ○ *any impacts of the proposed project on water bodies or protected areas (including shellfish protected areas) under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 and source protection zones SPZs) around potable groundwater abstractions"* and; Paragraphs 5.16.6–5.16.10 outline the decision-making process with regards to water pollution, and more weight is attributed to any impacts that would have an adverse effect on the achievement of environmental objectives established under the WFD. Within paragraphs 5.16.11-5.15.13 it is stated: • *"The Secretary of State should consider whether mitigation measures are needed over and above any which may form part of the project application (see Sections 4.2 and 5.1). A construction management plan may help codify mitigation at that stage."*
NPS for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (Ref 11-20)	The NPS for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) is also relevant and was published in July 2011. As of March 2023, an updated draft has been issued for consultation. Section 2.22 of this NPS cover the impacts of Gas and Oil Pipeline Impacts on Water Quality and Resources and states that: • "*Where the project is likely to have effects on water resources or water quality, for example impacts on groundwater recharge or on existing surface water or groundwater abstraction points, or on associated ecological receptors, the applicant should provide an assessment of the impacts in line with Section 5.15 of EN-1 as part of the ES. Where the project is likely to give rise to effects on water quality, for example through siltation or spillages, discharges from maintenance activities or the discharge of*

Policy Reference	Policy Context
	disposals such as wastewater or solvents, the applicant should provide an assessment of the impacts." In terms of mitigation, it states: • *"Where the project is likely to have effects on water resources or water quality, for example impacts on groundwater recharge or on existing surface water or groundwater abstraction points, or on associated ecological receptors, the applicant should provide an assessment of the impacts in line with Section 5.15 of EN-1 as part of the ES. Where the project is likely to give rise to effects on water quality, for example through siltation or spillages, discharges from maintenance activities or the discharge of disposals such as wastewater or solvents, the applicant should provide an assessment of the impacts."*
National Planning Policy Framework (NPPF)	
National Planning Policy Framework (NPPF) (Ref 11-21)	The NPPF has three overarching objectives to contribute to the achievement of sustainable development, one of which is the 'environmental objective'. This objective includes the requirement of: • "*helping to improve biodiversity, using natural resources prudently, and minimising waste and pollution"* (Paragraph 8c). The key NPPF statements relevant to these chapter include: • *"Strategic policies should set out an overall strategy for the pattern, scale, and quality of development, and make provision for 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). • *"Planning policies and decisions should contribute to and enhance the natural and local environment by preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans"* (paragraph 174e). • *"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"* (paragraphs 159 to 169). The paragraphs also state when an FRA is required and sets out the basis of the sequential and exception test: • "*All plans should apply a sequential, risk-based approach to the location of development – taking into account all sources of flood*

Policy Reference	Policy Context
	risk and the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property." Paragraph 174 ('Conserving and enhancing the natural environment') includes a statement that planning decisions: • "*should contribute to enhance the natural and local environment by preventing development that produces unacceptable levels of water pollution."*
National Planning Practice Guidance	
Planning Practice Guidance (PPG) Water supply, wastewater and water quality (last updated July 2021) (Ref 11-22)	Provides guidance for local planning authorities on assessing the significance of water environment effects of proposed developments. The guidance highlights that adequate water and wastewater infrastructure is needed to support sustainable development. It also sets out requirements for new developments to consider River Basin Management Plans and ensure compliance with the requirements of the Water Environment Regulations 2017.
Flood Risk and Coastal Change NPPG (Ref 11-23)	The NPPF and the Flood Risk and Coastal Change NPPG recommends that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA) and should 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 Internal Drainage Boards. Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to public and property and manage any residual risk, taking account of the impacts of climate change.
Defra's '25 Year Environment Plan'	
Defra published the 25 Year Environment Plan (updated October 2021) (Ref 11-24)	In 2018, Defra published the 25 Year Environment Plan (25YEP) (updated October 2021) setting out the UK Governments goals for improving the environment within a generation and leaving it in a better state than we found it. The plan covers the provision of clean air and water; protection and enhancement of habitats, wildlife and biosecurity; reducing the risk from environmental hazards and mitigating and adapting to climate change; using resources more sustainable and efficiently, minimizing waste and managing exposure to chemicals; enhancing beauty, heritage and engagement with the natural environment. The Plan includes specific goals to achieve good environmental status in our seas, reduce the environmental impact of water abstraction, meet the objectives of River Basin Management Plans under the Water Framework Directive (WFD), reduce leakage from water mains, improve the quality of bathing waters, restore protected freshwater sites to a favourable condition, and do more to protect communities and businesses from the impact of flooding, coastal erosion, and drought. At the heart of the Plan's delivery is the natural capital approach with the aspiring goal of a net gain in biodiversity from new development.

Policy Reference	Policy Context
Defra's 'Environmental Improvement Plan'	
Defra publishes the Environmental Improvement Plan (update 7th February 2023) (Ref 11-25)	In 2023 Defra published the Environmental Improvement Plan which is the first revision of the 25YEP (updated October 2021). It uses the same ten goals as the 25YEP and sets out the progress against them and specific targets and commitments made in relation to each goal. An 'apex goal' of thriving plants and wildlife has been set which all other goals will help to achieve. The Plan includes specific goals to reduce the pollution from agriculture into water, reduce the use of public water supply in England, restore water bodies to good ecological status and target a level of resistance to drought.
Defra's Plan for Water: our integrated plan for delivering clean and plentiful water	
Defra publishes the Plan for Water (update 4th April 2023)	In 2023 Defra published the Plan for Water which covers both the water environment and water resources. It covers actions to tackle sources of pollution such as storm overflows, agriculture, plastics, road run-off and chemicals. The Plan focuses on taking catchment-based approaches to deliver action plans. There are three main actions underpinning the plan and its goals: - Transforming the management of the whole water system - Delivering a clean water environment for nature and people by addressing each of the multiple pressures and sources of pollution on water bodies - Secure a plentiful supply of water – meet the long-term water needs for people, businesses, and the environment by closing the 4 billion litre a day supply-demand gap in public water supply
Future Water, The Governments Water Strategy for England	
The Government's Future Water Strategy (Ref 11-26)	The Government's Future Water Strategy published in 2008 sets out the Government's long-term vision for water and the framework for water management in England. It aims to enable sustainable and secure water supplies whilst ensuring an improved and protected water environment. Future Water brings together the issues of water demand, supply and water quality in the natural environment as well as surface water drainage and river/coastal flooding into a single coherent long-term strategy, in the context of the need to reduce greenhouse gas emissions. The strategy also considers the issue of charging for water. The water environment and water quality have great economic, biodiversity, amenity and recreational value, playing an important role in many aspects of modern-day society, and thus the functions provided must be sustainably managed to ensure they remain available to future generations without compromising environmental quality.
River Basin Management Plans	
Environment Agency (Ref 11-54)	At a regional level, water management is coordinated in England through eight River Basin Management Plans (RBMPs). RBMPs are prepared by the Environment Agency for six-year cycles and set out how organisations, stakeholders and communities will work together

Policy Reference	Policy Context
	to improve the water environment. Their review and update of the current RBMPs is underway. The consultation of the draft RBMPs ran from 22 October 2021 to 22 April 2022. The most recent plans were updated in 2022 (the third cycle) and will remain in place until 2027. The water features within the study area fall under the Louth Grimsby and Ancholme Management Catchment within the Humber River Basin district and Witham Management Catchment within the Anglian River Basin district.

Local Planning Policies

11.2.4 Local Planning Policies relevant to the water environment is detailed in **Table 11-2**. An overview of how relevant local planning policy has been complied with is provided within the *Planning Statement (Application Document 7.1)*.

Table 11-2: Local Planning Policies Relevant to the Water Environment

Policy Reference	Policy Context
Local Plans	
North East Lincolnshire Local Plan (March 2018) (Ref 11-27)	The northern extent of the Proposed Development lies within the administrative area of North East Lincolnshire Council (NELC). NELC has published a Local Plan which was adopted in 2018 and which outlines the Council strategy up to the year 2032. The following policies of the local plan are of relevance to the water environment: • *Strategic Objective SO2 – Climate Change* – Address the causes and effects of climate change by promoting development that minimises natural resource and energy use; reduces waste and encourages 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. • Strategic Objective SO6 – Built, historic and natural environment – Ensure that the development needs of the Borough are met in a way that safeguards and enhances the quality of the built, historic, and natural environment and ensures that the development needs are met in a way that minimises harm to them. Direct development to locations of least environmental value and proactively manage development to deliver net gains in biodiversity overall. Encourage the use of brownfield land. • *Policy 6 – Infrastructur*e – Contributions towards infrastructure will be based on the demands created by the specific development. This includes provision of new, or enhancement of the existing infrastructure and facilities, including, but not necessarily limited to drainage and surface water management (including SuDS maintenance where appropriate). • *Policy 33 – Flood risk* – In order to minimise flood risk impacts and mitigate against the likely effects of climate change, development proposals should demonstrate that:

Policy Reference	Policy Context
	○ A. 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; ○ B. there is no unacceptable increased risk of flooding to the development site or to existing properties; ○ C. the development will be safe during its lifetime; ○ D. Sustainable Drainage Systems (SuDS) have been incorporated into the development unless their use has been deemed inappropriate; ○ E. 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 aspects of green infrastructure in an integrated approach across the site; ○ F. arrangements for the adoption, maintenance and management of any mitigation measures have been established and the necessary agreements are in place; • *Policy 34 – Water management*. 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: ○ A. adequate and sustainable water supplies are available to support the development proposed; ○ B. provisions are made for the efficient use of water, including its 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, ○ C. 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. • Where development is proposed within a Source Protection Zone (SPZ), 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.
East Lindsey Local Plan (July 2018) (Ref 11-28)	The southern extent of the Proposed Development lies within the administrative area of East Lindsey Council (ELC). ELC has published a Local Plan which was adopted in July 2018, and which outlines the Council strategy up to the year 2032. The following policies of the local plan are of relevance to the water environment:

Policy Reference	Policy Context
	• *Policy 10 (SP10) – Design* – Development around water sources will only be supported if it contains adequate protection preventing pollution from entering into the water source. • *Policy 16 (SP 16) – Inland Flood Risk*: 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 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 non-feasible alternatives and where there is no detriment to existing users. • The Council will support development that demonstrates an integrated approach to sustainable drainage that has positive gains to the natural environment. • All new development must show how it can provide adequate foul water treatment and disposal or that it can be provided in time to serve the development. • Policy 24 (SP24) – Biodiversity and Geodiversity – Development proposals should seek to protect and enhance the biodiversity and geodiversity value of land and buildings and minimise fragmentation and maximise opportunities for connection between natural habitats.

West Lindsey Local Plan (July 2017) (Ref 11-29)	The local development plan for this area is found within the Central Lincolnshire Local Plan (adopted 2017). 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. The following policies of the local plan are of relevance to the water environment:
	• Policy LP1: A Presumption in Favour of Sustainable Development:
	  ○ 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.
	• Policy LP14: Managing Water Resources and Flood Risk:
	  ○ Through appropriate consultation and option appraisal, development proposals should demonstrate:
	  ○ 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;

Policy Reference	Policy Context
	○ 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. • Policy LP18: Climate Change and Low Carbon Living: ○ 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 process, avoiding products with a high embodied energy content; and (b) minimise construction waste; ○ 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.

Guidance

11.2.5 The water environment assessment has been carried out in accordance with the following:

- The Building and Regulations 2010 Approved Document Part H: Drainage and Waste Disposal, published by the Ministry of Housing, Communities & Local Government (Ref 11-30);
- Defra published guidance on the use, design and construction of SuDS in 'Non-statutory technical standards for SuDS (Ref 11-31);
- Industry good practice guidance on the planning for and design of SuDS is provided by:
- C753 The SuDS Manual (Ref 11-32);
- DMRB CD 532 (Ref 11-33); and
- DMRB CG 501 Design of Highway Drainage Systems (Ref 11-34).

11.2.6 Embedded mitigation and additional mitigation will be considered with reference to good practice (e.g., Guidance on Pollution Prevention and reports prepared by the Construction Industries Research and Information Association (CIRIA)).

11.3 Scope of Assessment and Consultation

Introduction

11.3.1 This chapter of the ES presents the assessment of likely significant effects on the surface water environment (including inland, transitional, and coastal surface waters) and flood risk as a result of Proposed Development, as described in *ES Volume II Chapter 3: Description of the Proposed Development,* of this ES *(Application Document 6.2.3).*

11.3.2 The scope of this assessment includes surface water quality, water resources, hydromorphology, flood risk and drainage.

11.3.3 This chapter does not include an assessment of likely effects of the Proposed Development to groundwater, which is considered separately within *Chapter 9: Geology and Hydrogeology,* of this ES *(Application Document 6.2.9).*

11.3.4 Environmental effects have been assessed for the construction, operational and decommissioning phases of the Proposed Development. The residual effects reported at the end of this chapter take account of embedded mitigation and the implementation of additional mitigation measures as described in this chapter.

Scoping Report and Scoping Opinion

11.3.5 A scoping exercise was undertaken in early 2022 to establish the content of the historic environment assessment and the approach and methods to be followed.

11.3.6 A summary of stakeholder engagement specific to the surface water environment has been provided in **Table 11-3**.

Table 11-3: Water Environment Scoping Opinion

Reference to Scoping Opinion	Applicant's proposed matter	Planning Inspectorate / prescribed consultee comments	Response
Planning Inspectorate Paragraph 11.8.10, Table 11-13	Hydraulic Modelling (pipeline component)	The Inspectorate has considered the information provided and considers that Hydraulic Modelling can be scoped out of the assessment in relation to the buried pipeline. It is noted that assessment of flood risk in relation to the other components of the Proposed Development is to be included in the ES. The approach to this assessment should be discussed with the relevant stakeholders and agreement sought on the methodology applied.	The approach to the assessment has been agreed through the scoping opinion, PEIR and through stakeholder consultation (see Table 11.4).
Planning Inspectorate Paragraph 11.8.10, Table 11-13	Foul drainage and Potable water Supplies	The Inspectorate considers that matters relating to Foul Drainage and Potable Water supplies should be assessed in the ES, where significant effects may arise as a result of the Proposed Development. The Inspectorate advises that advice is sought from the relevant consultees, in particular Anglian Water, to establish the likely risks in these regards.	These were initially scoped out as the risk from foul drainage / potable supply may be very low if there are few permanent staff on site in the long term. However, this has been scoped back into the chapter to ensure that the foul drainage / water demand will not result in any significant effects to surface water features or resources. The supply/demand has been identified and is addressed within the ES, following stakeholder engagement with Anglian water. This chapter includes an assessment of whether this results in any significant effects (Section 11.7).
Planning Inspectorate Section 11.6, Table 11-13	Potential effects	In addition to the identified matters proposed to be assessed, the ES should include an assessment of the likely significant effects of artesian groundwater conditions, and the presence of unique groundwater features (e.g. blow wells, chalk streams and springs), where these could occur.	The assessment of effects to groundwater, including unique groundwater features, is presented in *Chapter 9: Geology and Hydrogeology*. Where these groundwater features may result in a significant effect to surface water features these have been considered including dewatering (Section 11.7).

Reference to Scoping Opinion	Applicant's proposed matter	Planning Inspectorate / prescribed consultee comments	Response
Planning Inspectorate Paragraph 11.2.15	Presence of Ordinary Watercourses	The Scoping Report states that there are likely to be over 100 Ordinary Watercourses within 500m of the scoping boundary, including streams, drainage dykes, field drains and artificial water bodies. The ES should provide information on potential likely significant effects on or associated with Ordinary Watercourses, in particular where they are hydrologically linked to main rivers.	An exercise has been undertaken to identify all watercourses within the Study Area, including Ordinary Watercourses. Potential likely significant effects to Ordinary Watercourses have been identified and are included within this chapter. Stakeholder engagement with the Environment Agency (EA), local drainage boards and Lead Local Flood Authorities (LLFAs), as well as a best endeavours to visits to all Main Rivers and the majority of Ordinary Watercourses, which are directly crossed by the Proposed Development, has taken place to confirm the importance associated with Ordinary Watercourses (*ES Volume IV: Appendix 11.2 (Application Document 6.4.11.2)*.
Environment Agency	Flood Risk and hydraulic modelling	We support that a Flood Risk Assessment (FRA) will be undertaken to support the application. The FRA should follow relevant guidance in national planning policy. The FRA should consider all sources of flooding, which may include tidal, fluvial, ground water, drainage systems, reservoirs, canals and Ordinary Watercourses. The FRA should demonstrate that the proposal will be safe for the lifetime of the development, without increasing risk elsewhere and where possible reducing flood risk overall. The FRA should also provide evidence that appropriate mitigation measures including flood resilience techniques have been incorporated into the development. Paragraph 11.5.12 indicates the Proposed Development is likely to be defined as Essential	An FRA (*ES Volume IV: Appendix 11.5 (Application Document 6.4.11.5))* has been developed that has undertaken an assessment of all sources of flooding to the site.

Reference to Scoping Opinion	Applicant's proposed matter	Planning Inspectorate / prescribed consultee comments	Response
		Infrastructure. Therefore, we recommend that all critical infrastructures should be located above the flood depths expected for the 0.1% (1 in 1000) scenario including climate change, appropriate to the lifetime of development. Hydraulic Modelling can be scoped out of the assessment in relation to the buried pipeline. The Environment Agency's fluvial data and tidal hazard mapping should be used to inform the FRA. Our hazard mapping shows the consequences should a breach or overtopping of the sea defences occur, including the likely flood depths, velocities and overall hazard that could impact the site over its lifetime.	
	Foul drainage, potable water supplies and abstraction licences	Matters relating to Foul Drainage and Potable Water supplies should be assessed in the ES, where significant effects may arise as a result of the Proposed Development. The Inspectorate advises that advice is sought from the relevant consultees, in particular Anglian Water, to establish the likely risks in these regards. The requirement for an abstraction licence applies unless the activity is exempt under The Water Abstraction and Impounding (Exemptions) Regulations 2017. If the total programme exceeds 6 months then an abstraction licence will be required.	This chapter of the ES assesses impacts relating to foul drainage and potable water supplies, is proposed to use established supplies, potentially including Anglian Water, further details are provided in Section 11.6 and 11.7. No new abstraction licence(s) are proposed for water supply for the Proposed Development. Consultation with Anglian Water and other licence holders is ongoing.

Reference to Scoping Opinion	Applicant's proposed matter	Planning Inspectorate / prescribed consultee comments	Response
	Covenham Reservoir	The Proposed Development should consider the potential impacts on Covenham with Anglian Water as well as with the Environment Agency.	Covenham Reservoir has been considered within this impact assessment as a potential receptor (Section 11.5).
	Water Quality Data	Currently online Open WIMS dataset does not include all groundwater or third-party data. Additional data are available on request. Data may also be subject to change after publication.	The Open WIMS dataset has been reviewed for water quality data, and data has been obtained from the EA following consultation. This information has informed the baseline of this chapter (Section 11.5) to inform the impact assessment and is considered sufficient for purpose.
	Watercourse crossings	The EA support the proposal that non-intrusive drilling techniques will be used for main river crossings. Non-intrusive crossings are welcomed at all Ordinary Watercourses.	The crossing schedule has been updated following stakeholder consultation (see **Table 11-5**) to include non-intrusive drilling techniques for all main river crossings. Non-intrusive crossings have also been applied to many Ordinary Watercourses where there is an ecological or technical need identified. The crossing schedule is provided in *(ES Volume IV: Appendix 3.2, Application Document 6.4.3.2).*
	FRAP	Please note that under the Environmental Permitting (England and Wales) Regulations 2016, permission must be obtained from the Environment Agency for any proposed activities which will take place: • in, over, under or within 8 metres of a main river (16 metres if tidal) • on or within 8 metres of a flood defence structure or culvert (16 metres if tidal) • on or within 16 metres of a sea defence • within 16 metres of any main river, flood defence (including a remote defence) or culvert for	Any relevant consents, including FRAPs, will be applied prior to construction taking place. Buffer zones are to be applied around all watercourses, except at watercourse crossings. The size of this zone will be dependent on the type, maturity and quality of the vegetation and habitats in the vicinity of the watercourse and could be up to 10 m in width (see Section 11.6). In the case of main rivers this is over 8m from the top of the bank, batter, or toe of the flood defence or culvert surrounding the main river.

Reference to Scoping Opinion	Applicant's proposed matter	Planning Inspectorate / prescribed consultee comments	Response
		quarrying or excavation • in a flood plain more than 8 metres from the riverbank, culvert, or flood defence structure (16 metres if tidal) if planning permission has not already been granted for the works	
North East Lindsey Drainage Board	IDB Consents	The prior written consent of the Board is required for any proposed temporary or permanent works or structures within any watercourse including infilling or a diversion. The prior written consent of the Board is required for any proposed temporary or permanent works or structures in, under, over or within the byelaw distance of 9m from the top of the bank of a Board maintained watercourse. All drainage routes through the Sites should be maintained both during the works and after completion of the works. Provisions should be made to ensure that upstream and downstream riparian owners and those areas that are presently served by any drainage routes passing through or adjacent to the sites are not adversely affected by the development.	Consultation has taken place with Internal Drainage Boards (IDB) to identify all IDB watercourses. These are identified within this chapter and assessed for impacts (Section 11.7).
	Ordinary Watercourses and agricultural drainage	The ES should provide information on potential likely significant effects on or associated with Ordinary Watercourses, in particular where they are hydrologically linked to main rivers. The ES should also explain whether significant effects could arise from impacts to existing agricultural drainage, including effects on habitats outside of agricultural land relating to hydrological changes or degradation of water quality.	This chapter has identified all mapped drainage features and augmented this with targeted site surveys. This chapter has assessed the effects to Ordinary Watercourses and agricultural drainage, including hydrological changes and water quality (see Section 11.7).

Reference to Scoping Opinion	Applicant's proposed matter	Planning Inspectorate / prescribed consultee comments	Response
North Lincolnshire Council	SuDS and surface water drains	Surface water flood risk compliance needs to be mitigated against and the need to comply with SuDS requirements. The local internal drainage boards will need to be consulted, including NLC as the Lead Local Flood Authority where ordinary watercourse consents are required for alterations/connections to the local watercourse network.	Sustainable Urban Drainage Systems (SuDS) are proposed in the provisional outline design for above ground infrastructure (*ES Volume IV: Appendix 11.3* (*Application Document 6.4.11.3*)).

Feedback on the Preliminary Environmental Information Report

11.3.7 A summary of stakeholder engagement specific to the surface water environment has been provided in **Table 11-4**:

Table 11-4: Water Environment Feedback on PEIR

Stakeholder	Stakeholder comment	Response
Water Environment PEIR Chapter 11		
Canal and River Trust	Having reviewed the location of the Proposed Development and the relationship of the proposed pipeline and associated development sites with our network, we do not believe that the proposals shown would cross land owned or operated by the Trust. We are aware that the Louth Navigation Trust LNT) is dedicated to preserving the canal... that you are already in correspondence'.	LNT were contacted following receipt of this consultation response and ongoing attempts have been made for further discussion.
Environment Agency	<u>Groundwater Connectivity</u> This section discusses the potential for 'connectivity between groundwater and surface water towards the low-lying coastal areas to the east of the Study Area; for example the borehole at Immingham lies next to North Beck Drain'. This section should be clarified; does it refer to the potential for surface waters to impact on groundwaters due to borehole proximity, or for surface waters to be groundwater-fed due	The baseline section (Section 11.5) of this chapter has been updated to clarify the groundwater connectivity – the connectivity was between the waterbody and the monitored groundwater body which was the superficial deposits. The section referred to

Stakeholder	Stakeholder comment	Response
	to high groundwater levels (with reference to section 11.2 of Vol IV, Appendix 11.1, Water Environment Baseline Supporting Information)? Which groundwater-bearing aquifer is being referenced? The confined chalk is potentially hydraulically disconnected from surface waters along the eastern extent of the study area due to the low permeability quaternary deposits overlying the chalk, except where the presence of blow wells or springs indicates a weakness in the overburden allowing groundwater to emerge at the surface. Interactions are more frequent further west along the spring line. There is however likely to be continuity between shallow permeable drift deposits, which are likely to contain groundwater to some degree, and watercourses further east.	the potential for surface waters to be groundwater fed.
	<u>Main Rivers</u> States that 'The Proposed Development crosses seven watercourses classified as a Main River'. Based on the route plans and Figure 11-1 Surface Water Features, 6 main river crossings are shown. It is assumed this is due to the change in the route and the Poulton Drain crossing is no longer on the Main River – this should be clarified.	This was due to a change in the Preferred Pipeline Route around Poulton Drain, with a previous route crossing where this was a Main River. The baseline presented in this chapter (Section 11.5) has been updated to clarify the Main Rivers of relevance.
	<u>Flood risk data</u> Rivers and Sea. There are also areas of Flood Zone 3 from the Humber *Tidal:* Tidal hazard mapping (breach and overtopping) is available. Our tidal hazard mapping includes the area south of Section 4 as being impacted. Table 11-14: Tidal hazard mapping (breach and overtopping) for this area is available. *Flood Defences:* For Laceby Beck until Stallingborough and Healing area and most of Waithe Beck until around the A16 crossing, these are areas of high ground.	Fluvial and tidal breach mapping has been obtained and included within the FRA *(ES Volume IV Appendix 11.5 (Application Document 6.4.11.5)).*

Stakeholder	Stakeholder comment	Response
	For most of Poulton's Drain, these are high ground until upstream of the confluence with the Louth Canal. The Louth Canal and the River Lud, are sections of high ground and embankments. For South Dike, these are mainly embankments. The Long Eau embankments start further downstream than stated (although upstream of Little Carlton). The Great Eau embankments start further downstream than stated in the vicinity of Flax Mill Cottages. Environment Agency tidal hazard mapping. Our hazard mapping shows the consequences of a breach or overtopping of our sea defences, including the likely flood depths, velocities and overall hazard that could impact the area: 2009 Louth Canal Model; 2017 Saltfleet and Great Eau Model; Historic flood extents; Defence and asset data. The Environment Agency's data (especially fluvial data and tidal hazard mapping) should be used to refine the Proposed Development and inform the FRA.	
	<u>Climate Change.</u> This point states that "Climate change allowances are to be included within the assessment of flood risk in line with Environment Agency published flood maps". The published flood maps (Flood Map for Planning (Rivers and Sea) and Risk of Flooding from Rivers and Sea) do not include climate change.	Modelled results from the EA have been obtained which include climate change allowance. Climate change has been considered within the FRA *(ES Volume IV: Appendix 11.5 (Application Document 6.4.11.5))*.
	<u>Flood risk assessment</u> Current proposals include infrastructure and pipeline within the floodplain. Mitigation to ensure that the scheme remains operational at all times (including at times of flood) in accordance with the 'essential infrastructure' vulnerability category has not been included.	Mitigation with regards to facilities remaining operational during times of flood has been considered within the FRA *(ES Volume IV: Appendix 11.5, (Application Document 6.4.11.5))*.

Stakeholder	Stakeholder comment	Response
	Dewatering There is recognition that 'dewatering of the trench and other excavations may be required in some areas to stabilise the surrounding ground during construction'. It is stated within this section however that 'this activity would be subject to a separate consent under the Environmental Permitting (England and Wales) Regulations and an approved Permit to Pump would be required for all pumping operations (before dewatering or discharges commence)'. As stated previously, the abstraction is not subject to the Environmental Permitting Regulations (EPR) (yet) but is a licensable activity. The requirement for a Water Resources Abstraction Licence applies unless the activity is exempt under The Water Abstraction and Impounding (Exemptions) Regulations 2017. You will need to determine the need for an abstraction licence at an early stage. We advise early consideration be given to this so that permitting timescales can be built into the development programme so as not to cause delays.	Noted and included within the Proposed Development risks. Terminology changes within the chapter.
	Dewatering We recommend the developer should follow the Hydrological Impact Appraisal for dewatering abstractions guidance.	A Dewatering Risk Assessment will be undertaken at Front End Engineering Design (FEED) stage, where trenchless techniques for pipeline installation or dewatering is required. Where dewatering is required, the Contractor shall prepare site specific a Dewatering Scheme prior to construction (in consultation with the Environment Agency) as secured by the CEMP. Additional assessment of dewatering, including Hydrological Impact Appraisals, have been included as mitigation for dewatering of trenches under the detailed hydrogeological assessment (refer to section 11.9).

Stakeholder	Stakeholder comment	Response
	Permits The proposed development may need: a groundwater investigation consent (section 32/3 of the Water Resources Act 1991) to construct and test pump, and; a full abstraction licence (Water Resources Act 1991) if the volume of groundwater abstracted is greater than 20 m³/day and abstraction will occur for longer than a period of six consecutive months. Further guidance can be found at: https://www.gov.uk/guidance/water-management-abstract-orimpound-water#abstractions-that-need-a-licence. There may be a requirement for an associated EPR permit to discharge; this should also be considered at an early stage.	Noted.
	We welcome the provision for a Water Management Plan (WMP), Drainage Management Plan (DMP), Water Efficiency Management Plan, and a number of other environmental control plans in the Preliminary Draft Construction Environmental Management Plan (CEMP), which we appreciate will be updated as the Proposed Development progresses.	A 'Drainage Strategy' has been prepared for the DCO application (to replace the Drainage Management Plan in terms of terminology) (*ES Volume IV: Appendix 11.3, Application Document 6.4.11.3)*. The Water Management Plan (WMP) is to be developed by the Contractor during FEED. The Water Efficiency Management Plan is to be developed by the Contractor post-consent.
	The PEIR states that it is based on an initial crossing schedule, which is subject to further refinement. Chapter 11 recommends that non-intrusive drilling techniques are applied for most main river crossings and WFD waterbodies (unless justified). As previously advised, we expect that all main river crossings will be trenchless, however, it is noted that the crossing of the Greyfleet Drain main river is open-cut. Until preferred options are confirmed, we cannot fully judge the impact of the proposed watercourse crossings.	The Crossing Schedule *(ES Volume IV: Appendix 3.2, Application Document 6.4.3.2)* has been updated to incorporate stakeholder feedback and Greyfleet Drain is now a non-intrusive crossing.
	The potential impacts of the construction of the scheme and the risks associated with the crossing of the defences and large watercourses	Where possible, the design has sought to avoid impacts to the more important and

Stakeholder	Stakeholder comment	Response
	with raised embankments will need to be addressed. These risks will steer the appropriate mitigation (e.g. trenchless crossings), in addition to any other measures that are identified as necessary, such as bunding the pits etc. All associated construction activities (e.g. reception pits and compounds) should be set back from any main river, or from the toe of any flood defences. There are likely to be constraints unique to each crossing and we will be able to provide further advice as the proposals are considered and refined. We would welcome early discussions on the main river crossings, particularly on the methodology and temporary works to facilitate the pipeline installation. The working corridor impacts upon main river and floodplain. Access for maintenance and/or access to any part of the main river for blockage removal is required. Again, we would welcome discussion on this as proposals and crossing points are refined	sensitive water environment receptors through use of trenchless pipeline crossings, and bailey bridge access crossings. The considerate placement and design of construction features has also sought to avoid areas at risk of flooding, key flood protection features, protected areas or more important and sensitive watercourses.
	Environmental Permitting – Flood Risk Activities We would welcome early notification of any intention to request the disapplication of relevant legislation to allow discussion/negotiation of protective provisions for the Environment Agency.	Noted.
	Under the Environmental Permitting (England and Wales) Regulations 2016, permission must be obtained from the Environment Agency for any proposed activities which will take place: • in, over, under or within 8 metres of a main river (16 metres if tidal); • on or within 8 metres of a flood defence structure or culvert (16 metres if tidal); • on or within 16 metres of a sea defence; • within 16 metres of any main river, flood defence (including a remote defence) or culvert for quarrying or excavation; • in a flood plain more than 8 metres from the river bank, culvert or flood defence structure (16 metres if tidal) if planning permission has not already been granted for the works. Where possible an exemption may be useable should the criteria be met. The exemption most suitable for this type of development would	Noted. Refer to *Other Consents and Licenses (Application Document 7.2)* for more details

Stakeholder	Stakeholder comment	Response
	be FRA 3: “Service crossing below the bed of a main river not involving an open cut technique”. The exemption criteria can be found at: Exempt flood risk activities: environmental permits – GOV.UK (www.gov.uk)	
	Environmental permitting for flood risk activities will be complex and needs to be considered well in advance of your application submission. Whether or not disapplication is pursued, the permitting work will need significant consideration. We strongly recommend further discussions on the permitting aspects of this project.	A schedule of the currently known consents and licences required for the Proposed Development are provided within the Consents and Agreements Position Statement (*Application Document 7.2*). The Contractor will be responsible for identifying any further statutory consents required for the construction, pre-commissioning and re-instatement of the Proposed Development. It is recognised that Flood Risk Activity Permits (FRAPs) will be a required secondary consent.
Natural England	The Water Environment Chapter has detailed all potential impacts to the relevant designated sites via the likely pathways linking the sites from the DCO boundaries within all sections of the pipeline. It is noted in Section 11.6.7 that the CEMP will incorporate appropriate mitigation measures as required for designated sites and that further site visits are being undertaken to determine such requirements. Natural England are happy to engage with the applicant through our existing DAS contract to discuss the mitigation measures as required where they may affect internally or nationally designated sites.	Designated sites have been considered within this chapter as well as the WFD assessment (*ES Volume IV: Appendix 11.4 (Application Document 6.4.11.4).*
North Lincolnshire Council	The developer needs to fully address whether there are any water resources including surface water e.g. rivers, lakes/ponds, riparian/land drainage systems, coastal or underground waters on or around the location which could be affected by the Proposed Development, particularly in terms of their volume and flood risk?	This chapter of the ES and the FRA considers all surface water resources, with groundwater covered within Chapter 9. Flood risk has been considered within the FRA. Consideration has taken place in this ES in terms of likely flow within each waterbody.

Stakeholder	Stakeholder comment	Response
	The local internal drainage board will need to be contacted with respect to any alterations into the watercourse network within their area of jurisdiction. I have copied Guy Hird from the IDB into this email for your information and I would still expect any planning application to be accompanied by a Flood Risk Assessment & Drainage Strategy to take until consideration any additional hard paved aeras / buildings are proposed.	Both relevant IDBs have been contacted and consulted with.
WFD Assessment		
Environment Agency	The Preliminary Water Framework Directive (WFD) assessment appears to include the correct information from the Catchment Data Explorer and has identified the appropriate waterbodies.	Noted.
	Indicates that groundwater is scoped into the WFD assessment for both Quantity and Chemical elements, due to groundwater ingress to excavations. For Quantity, the potential for uncontrolled water resource loss, due to unexpected artesian flow, should also be included. For Chemistry, the potential for pollution from disturbing contaminated ground (mobilising contaminants) or pollution incidents should be included. Both of these will be mitigated within the CEMP however reference to the potential risk should be made.	The potential for uncontrolled water resource loss, due to unexpected artesian flow and the potential for pollution from disturbing contaminated ground (mobilising contaminants) or pollution incidents have been included within *ES Volume IV: Appendix 11.4* (*Application Document 6.4.11.4*).
	11.4.3 and 11.9.1 discuss the foul drainage arrangements for welfare facilities, which are 'anticipated to consist of a self-contained independent non-mains domestic storage and/or treatment system. An alternative where this is not possible, would be for a self-contained foul drainage system to a septic tank or similar. These tanks would be regularly emptied under contract with a registered recycling and waste management contractor.' Septic tanks have a discharge outlet and are not contained systems. Under General Binding Rules (GBRs) (General binding rules for small sewage discharges (SSDs) with effect from January 2015 – GOV.UK (www.gov.uk)) septic tanks cannot discharge to surface water, only to ground, and if GBRs can't be met then an	Provisions for foul drainage include collection of foul drainage, which would be self-contained and removed from site for treatment. No septic tanks are included within the current proposals.

Stakeholder	Stakeholder comment	Response
	EPR permit will be required. This needs further consideration/clarification.	
	The proposed pipeline route crosses a number of priority habitat Chalk Streams including the designated WFD watercourses of North Beck, Laceby Beck and Waithe Beck and non-designated WFD watercourses such as the one at National Grid Reference TA1974206440. The importance of these watercourses must be considered when the EIA is developed. The construction and operation of the pipeline must avoid further deterioration of these key habitats and must not reduce the scope for any future improvements of these chalk streams. It would be beneficial if the applicant considered any opportunities to work with organisations such as the Lincolnshire Chalk Stream Partnership for this development to contribute to the improvement of these streams. There may be opportunities for Biodiversity Net Gain (BNG) that could be secured via this project, for example for river restoration. Although not compulsory for Nationally Significant Infrastructure Projects yet, others are aiming to deliver BNG in the Humber. For instance, Orsted is contributing to the funding of a project by Yorkshire Wildlife Trust to restore 4 hectares of seagrass in the Humber estuary and release 500,000 native oysters	Chalk streams have been assessed within this ES chapter as receptors that are of very high importance (Section 11.5) to take account of their sensitivity and that they are an important key habitat. Additional mitigation has been recommended where necessary (Section 11.9) to ensure robust protection of these receptors.
Flood Risk		
Environment Agency	The Viking CCS pipeline project includes sections of the pipeline route (including a working corridor, temporary construction works, and permanent infrastructure) that fall within the floodplain. The Non-Technical Summary also refers to temporary facilities at both the Immingham Facility and Theddlethorpe Facility (likely to include a site office/cabin with electricity and water supply and welfare facilities, a materials and equipment storage area including crane, earthmovers. A concrete batching plant is envisaged for the Theddlethorpe Facility). All facilities to be sited in flood zones 2 and 3 will need to be included in the FRA.	All facilities have been accounted for in the FRA (see *ES Volume IV: Appendix 11.5 (Application Document 6.4.11.5)).*

Stakeholder	Stakeholder comment	Response
	The full FRA must assess the risk of flooding to and from the development, from all sources of flooding to the scheme as a whole, including residual risk. The FRA must demonstrate how risk (for each phase) will be managed to ensure that the development remains safe and operational throughout its lifetime, taking climate change into account, without increasing flood risk elsewhere and where possible reducing flood risk overall. The FRA should also provide evidence that appropriate mitigation measures including flood resilience techniques have been incorporated into the development.	Appropriate mitigation has been recommended for the proposed development in the FRA *(see ES Volume IV: Appendix 11.5 (Application Document 6.4.11.5))*
	For development defined as 'Essential Infrastructure', it should be designed and constructed to remain operational and safe in times of flood. Therefore, we recommend that all critical operational elements should be located above the flood depths expected for the 0.1% (1 in 1000) scenario including climate change, appropriate to the lifetime of development.	The Flood Risk team have discussed with the Environment Agency and agreed that the development will still be defined as 'Essential Infrastructure', however it will not remain operational during a breach event due to the facilities producing CO_2 shutting down during a flood event. Appropriate mitigation has been recommended for the proposed development in the FRA *(See ES Volume IV: Appendix 11.5 (Application Document 6.4.11.5)) as agreed.*
	Section 11.9 confirms that it may be necessary to assess the credible maximum climate change and refer to the H++ scenario for sea level rise only. The relevant National Policy Statements also suggest a 'credible maximum' is applied to account for future flood risk. The range of climate allowances that should be considered is explained at Flood risk assessments: climate change allowances – GOV.UK (www.gov.uk), including the 'credible maximum'.	A credible maximum scenario is assessed for the proposed development in the FRA *(see ES Volume IV: Appendix 11.5 (Application Document 6.4.11.5))*
	Summary of Flood Risk including Table 11-14: This section should be reviewed and refined taking into account the additional Environment Agency data. Further assessment of the risk of flooding to and from the proposals will inform the appropriate mitigation (e.g. trenchless	An appropriate assessment for the proposed development has been undertaken in the FRA *(see ES Volume IV: Appendix 11.5 (Application Document 6.4.11.5))*

Stakeholder	Stakeholder comment	Response
	crossings) and any other additional measures that are identified as necessary.	
	Summary of Flood Risk Sections 1 – 5, Section 5, Tidal: This is at risk of flooding from the North Sea, not the Humber.	An appropriate assessment for the proposed development has been undertaken in the FRA *(see ES Volume IV: Appendix 11.5 (Application Document 6.4.11.5))*

Additional Consultation

11.3.8 A summary of stakeholder engagement specific to the surface water environment has been provided in **Table 11-5.**

Table 11-5: Water Environment Additional Consultation

Stakeholder	Date of meeting / communication	Summary of discussions
Louth Navigation Trust	Email Correspondence 20 March 2023	The Louth Navigation Trust were contacted on the 2 March 2023 to provide the latest information on the Proposed Development, to request feedback on the proposals, and to request any additional data that may be held on the Canal. The Louth Navigation Trust responded on the 20 March 2023 stating they agree with the proposed crossing of the canal via horizontal directional drilling (HDD), the scheduled monument near the crossing and also include potential improvements that would be welcomed including removal of a redundant pipeline downstream of Tetney.
Environment Agency	23 November 2022	A virtual meeting was held with the Environment Agency to provide an overview of the PEIR changes to the Proposed Development and an overview of the crossing schedule. The EA provided the feedback that Main Rivers should only be crossed with non-intrusive techniques.
	29 June 2023	A virtual meeting was help with the Environment Agency to discuss breach flood water levels which were sent by the EA at the Immingham and Theddlethorpe facilities. Mitigation and vulnerability classifications of 'essential infrastructure' for the facilities were discussed. It was decided that the pipeline would shut down during flood events. In terms of the mitigation and raising of critical infrastructure the outcome was that a decision should be made by The Applicant based on the business related/commercial risk of shutting the operation down and the decision should be driven by the ability of the operation to be brought back on-line following a flood event.
Lindsey Marsh Drainage Board	14 December 2022	A virtual meeting was held with Lindsey Marsh Drainage Board to provide an overview of the Proposed Development and a short summary of proposed crossing techniques. As an introductory meeting there was no formal feedback given.

Stakeholder	Date of meeting / communication	Summary of discussions
	12 January 2023 - 22 March 2023	An extract of the preliminary crossing schedule was supplied to the IDB, which shows the proposed crossing technique for each of the drains within their jurisdiction for comment (12/01/2023). The IDB provided a response (22/03/2023) indicating additional crossings that may be impacted.
North East Lindsey Drainage Board	11 January 2023	A virtual meeting was held with North East Lindsey Drainage Board to provide an overview of the Proposed Development and a short summary of proposed crossing techniques. As an introductory meeting there was no formal feedback given.

Scope of Assessment

11.3.9 The scope of this assessment has been established through a robust scoping process. Further information can be found in *Chapter 5: EIA Methodology* of this ES.

11.3.10 This section provides an update to the scope of the assessment presented in the *Viking CCS Pipeline PEIR Vol II Chapter 11 Water Environment* (Ref 11-53) and the evidence base for scoping out elements following further iterative assessment.

Aspects scoped into the assessment

11.3.11 The following topics are scoped into this assessment within the chapter:

- Surface water feature receptors (including those covered by designated sites) in terms of water quality, hydromorphological and hydrological effects;
- Effects to water resources, associated with water quality or changes to water availability, including public abstractions and private water supplies;
- Effects of the Proposed Development on drainage, flood risk and flood risk receptors; and
- Consideration of potential effects associated with water supply and foul drainage associated with the Proposed Development.

11.3.12 In addition to the above, this assessment is supported by specific assessments to align with guidance:

- *ES Volume IV: Appendix 11.4 (Application Document 6.4.11.4)*, which considers the potential effect of the Proposed Development on the WFD classifications of waterbodies within the study area; and
- *ES Volume IV: Appendix 11.5 (Application Document 6.4.11.5)*, which assessed the potential flood risks to the Proposed Development, as well as potential changes to flood risk to off-site receptors due to the proposals.

Aspects scoped out of the assessment

11.3.13 The only aspects that have been scoped out of the assessment are related to project specific monitoring and assessment, and are as follows:

- Hydraulic modelling of the Proposed Development has been excluded, given that the pipeline will be buried and permanent above ground infrastructure is located outside of the fluvial floodplain;

- Project specific water quality monitoring has been excluded, as there are no permanent discharges associated with the Proposed Development aside from stormwater drainage.

11.3.14 Groundwater and all groundwater elements is covered in *Chapter 9: Geology and Hydrogeology* of this ES, and is therefore excluded from assessment within this chapter.

11.4 Assessment Methodology

Overview

11.4.1 This section provides a description of the tools and techniques used to undertake the preliminary water environment impact assessment. It also outlines the significance criteria used with reference to any relevant legislation and/or guidance.

11.4.2 There is no standard guidance in place for the assessment of the likely significant effects on the Water Environment from developments of this type. Based on professional judgement and experience of other similar schemes, a qualitative assessment of the likely significant effects on surface water quality and water resources has been undertaken.

11.4.3 The classification and significance of effects has been determined using the principles of the guidance and the criteria set out in DMRB LA 113 Road Drainage and the Water Environment (Ref 11-35) adapted to take account of hydromorphology. Although these assessment criteria were developed for road infrastructure projects, this method is suitable for use on any development project, and it provides a robust and well tested method for predicting the significance of effects.

11.4.4 This methodology differs from the EIA methodology set out in *Chapter 5 EIA Methodology of this ES),* as it allows for a more detailed assessment of the potential impacts to surface water features and receptors. This also ensures that the assessment of the surface water receptors takes into account the requirements of the Water Framework Directive and aligns with comparable linear developments throughout the United Kingdom.

11.4.5 The preliminary assessment of impacts will be undertaken using a source-pathway-receptor model:

- *Source* – proposed Project change (e.g. release of chemical pollutant, physical impact to the form of surface water feature, or change in flood risk etc);
- *Pathway* – the method or route by which the source could affect the receptor; and
- *Receptor* – the feature that may be affected by the outcomes of the Proposed Development.

11.4.6 The assessment broadly follows the guidance and methodologies set out in the DMRB Sustainability and Environment; LA113 Road Drainage and the Water Environment (Ref 11-35). Whilst the DMRB is not specific to the assessment of a CO_2 pipeline, it provides an accepted approach to the assessment of development impacts for linear projects.

11.4.7 In accordance with the stages of the methodology, there are three stages to the assessment of effects on the Water Environment, which are as follows:

- A level of importance (negligible to very high) is assigned to the water resource receptor based on a combination of attributes (such as the size of the watercourses, WFD designation, water supply and other uses, biodiversity and recreation etc.) and on receptors to flood risk based on the vulnerability of the receptor to flooding (see **Table 11-6**);
- The magnitude of potential and residual impact (classed as negligible, minor, moderate or major adverse / beneficial) is determined based on criteria in **Table 11-7** and the

assessor's professional judgement and the likelihood of the effect occurring. Potential impacts are those that occur having taken account of embedded measures, but before consideration of any required additional mitigation. Residual impacts are the remaining impacts having also taken account of the additional mitigation. The likelihood of an effect occurring is based on a scale of certain, likely or unlikely; and

- A comparison of the importance of the receptor and magnitude of the impact (for both potential and residual impacts) results in an assessment of the overall significance of the effect on the receptor using the matrix presented in **Table 11-8.** The significance of each identified effect (both potential and residual) is classed as very large, large, moderate, slight or neutral and either beneficial or adverse significance. Where there is a range of effects (e.g., large / very large, see **Table 11-8**) professional judgement has been used to determine the residual effect.

11.4.8 A precautionary approach to the assessment has been undertaken to ensure that where uncertainty currently lies with any assessment work, a reasonable worst-case assessment has been made to the identification of a particular effect's significance.

Receptor Importance

11.4.9 All the receptor categories identified below have been assessed within the zones of influence outlined in Section 11.5. The potential receptors associated with the Proposed Development have been identified to include:

- Surface watercourses (including WFD designated, Main Rivers, and Ordinary Watercourse (including drains);
- Coastal and transitional water bodies;
- Water dependent designated and non-designated sites;
- Water resources, including reservoirs, water abstractions, foul drainage and water supply; and
- Flood risk receptors (including people, property and infrastructure).

11.4.10 The importance of a hydrological receptor is largely determined by its quality, rarity, and scale. Value is used preferentially for the water environment as low value receptors can sometimes be the most sensitive to change and this could lead to an inappropriately large effect. The importance and / or where appropriate, the importance of the receptors have been defined using the criteria outlined in **Table 11-6**.

11.4.11 The potential impacts to groundwater receptors, including aquifers and artesian water features will be covered within *Chapter 9: Geology and Hydrogeology* of this ES. Potential impacts to ponds and other minor standing water features are covered within *Chapter 6: Ecology and Biodiversity*.

Table 11-6: Importance (and Sensitivity) Criteria[1]

Importance	General criteria	Surface Water	Hydromorphology[2]	Flood Risk
Very High	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.	Watercourse having a WFD classification as shown in a River Basin Management Plan (RBMP) and Q95 ≥ 1.0m^3/s; site protected / designated under international or UK habitat legislation (SAC, SPA, SSSI, WPZ, Ramsar site. Critical social or economic uses (e.g., public water supply and navigation).	Unmodified, near to or pristine conditions, with well-developed and diverse geomorphic forms and processes characteristic of river and lake type.	Essential Infrastructure or highly vulnerable development.
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance.	Watercourse having a WFD classification as shown in a River Basin Management Plan (RBMP) and Q95 < 1.0m^3/s; Major Cyprinid Fishery; Species protected under international or UK habitat legislation. Critical social or economic uses (e.g., water supply and navigation). Important social or economic uses such as water supply, navigation or mineral extraction.	Conforms closely to natural, unaltered state and will often exhibit well-developed and diverse geomorphic forms and processes characteristic of river and lake type. Deviates from natural conditions due to direct and/or indirect channel, floodplain, bank modifications and/or catchment development pressures.	More vulnerable development.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value or is of regional importance.	Watercourse detailed in the Digital River Network but not having a WFD classification as shown in a RBMP. May be designated as a local wildlife site (LWS) and support a small / limited population of protected species. Limited social or economic uses.	Shows signs of previous alteration and/or minor flow / water level regulation but still retains some natural features or may be recovering towards conditions indicative of the higher category.	Less vulnerable development.

Importance	General criteria	Surface Water	Hydromorphology[2]	Flood Risk
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance.	Surface water sewer, agricultural drainage ditch; non-aquifer WFD Class 'Poor' or undesignated. Low aquatic fauna and flora biodiversity and no protected species. Minimal economic or social uses.	Substantially modified by past land use, previous engineering works or flow / water level regulation. Watercourses likely to possess an artificial cross-sector (e.g., trapezoidal) and will probably be deficient in bedforms and bankside vegetation. Watercourses may also be realigned or channelised with hard bank protection, or culverted and enclosed. May be significantly impounded or abstracted for water resources use. Could be impacted by navigation, with associated high degree of flow regulation and bank protection, and probable strategic need for maintenance dredging. Artificial and minor drains and ditches will fall into this category.	Water compatible development.
Negligible	The receptor is resistant to change and is of little environmental value	Not applicable.	Not applicable.	Not applicable.

Note 1: Professional judgement is applied when assigning an importance category to all water features. The WFD status of a watercourse is not an overriding factor, and, in many instances, it may be appropriate to upgrade a watercourse which is currently at poor or moderate status to a category of higher importance to reflect its overall value in terms of other attributes and WFD targets for the watercourse. Likewise, a watercourse may be below Good Ecological Status, this does not mean that a poorer quality discharge can be emitted. All controlled waters are protected from pollution under the Environmental Permitting (England and Wales) Regulations 2016 and the Water Resources Act 1991 (as amended), and future WFD targets also need to be considered.

Note 2: Based on the waterbody 'Reach Conservation Status' presently being adopted for a major infrastructure project (and developed originally by Atkins) and developed from Environment Agency conservation status guidance as LA113 does not provide any criteria for morphology.

Magnitude of Change

11.4.12 The duration of effects has been determined using a scale of (classed as negligible, minor, moderate, or major adverse / beneficial) seen in **Table 11-7**.

Table 11-7: Determining Magnitude of Change

Level of Magnitude	Definition of Magnitude and Examples
Large Adverse	Results in a loss of attribute and/ or quality and integrity of the attribute. For example, loss of a fishery; decrease in surface water ecological or chemical WFD status or groundwater qualitative or quantitative WFD status. Loss of regionally important public water supply. Change in flood risk to receptor from low or medium to high.
Medium Adverse	Results in impact on integrity of attribute, or loss of part of attribute. For example, partial loss of a fishery; measurable decrease in surface water ecological or chemical quality, or flow; reversible change in the yield or quality of an aquifer; such that existing users are affected, but not changing any WFD status. Change in flood risk to receptor from low to medium.
Low Adverse	Results in some measurable change in attribute's quality or vulnerability. For example, measurable decrease in surface water ecological or chemical quality, or flow; decrease in yield or quality of aquifer; not affecting existing users or changing any WFD status. Change in flood risk to receptor from no risk to low risk.
Negligible	Results in impact on attribute, but of insufficient magnitude to affect the use or integrity. For example, negligible change discharges to watercourse or changes to an aquifer which lead to no change in the attribute's integrity.
Low Beneficial	Results in some beneficial impact on attribute or a reduced risk of negative impact occurring. For example, measurable increase in surface water ecological or chemical quality; increase in yield or quality of aquifer not affecting existing users or changing any WFD status. Change in flood risk to receptor from low risk to no risk.
Medium Beneficial	Results in moderate improvement of attribute quality. For example, measurable increase in surface water quality or in the yield or quality of aquifer benefiting existing users but not changing any WFD status. Change in flood risk to receptor from medium to low.
Large Beneficial	Results in a major improvement of attribute quality. For example, measurable increase in surface water quality or in the yield or quality of aquifer benefiting existing users leading to an improvement in WFD status. Removal of an existing polluting discharge or removing the likelihood of polluting discharges occurring to a watercourse. Change in flood risk to receptor from high to medium or low.
No Change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Significance Criteria

11.4.13 The significance of environmental effect is typically a function of the value/importance of a receptor and the magnitude of an impact.

Table 11-8: Classification on Significance of Effect

Magnitude of change	Importance of receptor				
	Very High	High	Medium	Low	Negligible
Large	Major	Major	Moderate or Major	Minor or Moderate	Negligible
Medium	Major	Moderate or Major	Moderate	Minor	Negligible
Low	Moderate or Major	Minor or Moderate	Minor	Negligible to Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Water Framework Directive Assessment

11.4.14 A WFD assessment has been prepared for the Proposed Development. This is presented within *ES Volume IV: Appendix 11.4 (Application Document 6.4.11.4)*. The overarching aim of the WFD is to protect and enhance watercourses.

11.4.15 There is no fixed method for WFD assessment: the nature of the water environment and the breadth of the legislation mean that assessments are tailored on a case-by-case basis. However, a stepwise approach consisting of Screening, Scoping, and Impact Assessment is generally followed to: (a) rationalise the levels of WFD assessment and impact mitigation that are required; and (b) verify that proposals meet the requirements of the WFD.

Stage 1: Screening

11.4.16 Screening identifies the zone of influence of a project, and if proposed activities pose a risk to the water environment. It is used to identify if there are activities that do not require further consideration for WFD objectives, for example activities which have been ongoing since before the current RBMP plan cycle and which have thus formed part of the baseline.

Stage 2: Scoping

11.4.17 Scoping is used to identify any potential impacts of the proposed activities to specific WFD receptors and their water quality elements. This involves review of WFD impact pathways, shortlisting which WFD water bodies and quality elements could or could not be affected by proposed activities, and collecting baseline information from the relevant RBMP on the status and objectives for each water body.

Stage 3: Impact Assessment

11.4.18 This involves rationalised assessment of water bodies and quality elements that could be affected by proposed activities, in order to identify any areas of WFD non-compliance. Proposed activities are reviewed in terms of both positive and negative impacts, and the baseline mitigation measures, enhancements, and contributions to the WFD objectives described in the RBMP. Any proposed activities with potentially deleterious impacts are reviewed simultaneously with their corresponding mitigation proposals, to determine a net effect on WFD objectives.

Flood Risk Assessment (FRA)

11.4.19 A site-specific FRA has been prepared for the Proposed Development. This is presented within *ES Volume IV: Appendix 11.5 (Application Document 6.4.11.5)*. The FRA has been prepared in accordance with the requirements of the NPPF (Ref 11-21) and the accompanying NPPG (Ref 11-22), regional and local policy, and considering future climate change. It includes a full review of the flood sources to the Proposed Development. The

FRA *(ES Volume IV: Appendix 11.5 (Application Document 6.4.11.5))* also demonstrates how the Sequential Test and Exception Test have been complied with.

11.4.20 Assumptions and limitations relating to flood risk are outlined in the FRA *(ES Volume IV: Appendix 11.5 (Application Document 6.4.11.5)).*

Assumptions and Limitations

11.4.21 The assessment has been undertaken using available data sources listed in Section 11.5, which are assumed to be an accurate representation of the water environment of the Proposed Development and surrounding area at the time of writing. It is also based on understanding of flow pathways as observed during the surveys and site walkovers. Assumptions have been made regarding flow pathways for inaccessible and culverted sections of watercourses, based on OS mapping.

11.4.22 The EIA process enables good decision-making based on the best possible available information about the environmental implications of a project. However, there is often a degree of uncertainty as to the exact scale and nature of the environmental impacts and in such cases the worst-case scenario has been considered.

11.4.23 No water quality monitoring was undertaken, as it was not necessary to categorise the baseline or for the assessment. Project specific water quality monitoring has been excluded, as there are no permanent discharges associated with the Proposed Development aside from stormwater drainage. Background water quality was determined from the nearest Environment Agency monitoring stations. This data is described in *ES Volume IV: Appendix 11.1 (Application Document 6.4.11.1).* This approach was set out in the scoping report and received no comments from stakeholders.

11.4.24 A reasonable assumption has been made that all works will take place using good practice (which is considered standard mitigation). Good practice guidance is referred to in this chapter and also includes the measures set out in the Draft Construction Environmental Management Plan (CEMP) (see *ES Volume IV: Appendix 3.1 (Application Document 6.4.3.1)).*

11.5 Baseline Conditions and Study Area

Study Area

11.5.1 The local hydrological area of influence is defined by the potential for direct impacts on surface water resource and flood risk receptors (refer to Section 11.6) from the construction, operation and decommissioning of the Proposed Development.

11.5.2 For the purposes of this assessment, a general study area (zone of Influence) of 500m from the Proposed Development site boundary has been considered in order to identify water features that are hydrologically connected to the Proposed Development and have the potential to be directly impacted by the activities associated with it. This has been extended to 2km to check for hydrological connectivity to any designated sites that may need consideration. **Figure 11-1** shows the study area, the zone of influence and the surface water features associated with the Proposed Development.

11.5.3 Given that watercourses flow, water quality and flood risk impacts may propagate downstream. Where relevant, the assessment will also consider a wider study area to include as far downstream as a potential impact may influence the quality or quantity of the water body (which in this case is typically for a few kilometres). The two ultimate downstream receptors which can conceivably be impacted are the Humber Lower Water Body (GB530402609201) and the Coastal Lincolnshire Water Body (GB640402492000). Professional judgement has been applied to identify the extent to which such features are considered to be impacted by the Proposed Development.

11.5.4 In terms of flood risk, the study area takes into consideration the crossing of Main Rivers and Ordinary Watercourses including the crossing of associated floodplains which may be physically impacted.

11.5.5 Groundwater is included in the baseline; however, this topic is considered further in *Chapter 9: Geology and Hydrogeology, of this ES*. A buffer zone of 500 m extending from the DCO Site Boundary is considered an appropriate study area for the assessment (and up 2km for groundwater abstractions) of hydrogeological effects, in line with *Chapter 9: Geology and Hydrogeology of this ES.*

11.5.6 Due to the large spatial nature of the Proposed Development, the baseline has subsequently been split into the route sectors based on key road intersections (**Figure 11-1**):

- Section 1 – Rosper Road (Immingham) 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 and down to MLWS.

Data Sources

11.5.7 The data sources for the assessment are based on a desk-based study and walkover surveys, which are described in the following sections.

Desk Based Study

11.5.8 The desk-based study has been undertaken to identify the water features within and adjacent to the Proposed Development, and to gather and critically evaluate relevant data and information on their condition and attributes. The baseline information for this chapter has been derived from:

- British Geological Survey (BGS) online Borehole and Geology Mapping (Ref 11-36);
- Cranfield Soilscapes Map (Ref 11-37);
- Defra's Multi-agency geographical information for the countryside website (MAGIC) map (Ref 11-38);
- East Lindsey Strategic Flood Risk Assessment (Ref 11-39).
- Environment Agency Catchment Data Explorer tool (Ref 11-40);
- Environment Agency details of licenced abstractions and discharge permits;
- Environment Agency Flood map for planning (rivers and sea) (Ref 11-41);
- Environment Agency Flood warning areas and risk;
- Environment Agency Hydraulic model outputs for Louth Canal, River Freshney, Saltfleet and Great Eau, Stallingborough and Old Fleet;
- Environment Agency Main River Network Map (Ref 11-42);
- Environment Agency Online Interactive Maps (Ref 11-41 and Ref 11-43):
- Environment Agency Risk of flooding from reservoirs;
- Environment Agency Risk of flooding from surface water;
- Environment Agency Tidal Breach model output layers;
- Information available from the Natural England Designated Sites website (Ref 11-44);

- Land Use Mapping (Ref 11-45);
- Local Authority details of Private Water Supplies;
- Meteorological Office website for general climate information for the study area (Ref 11-46);
- National Rivers Flow Archive website (Ref 11-47);
- North and North-East Lincolnshire Strategic Flood Risk Assessment 2011 (Ref 11-48); and
- Online Ordnance Survey (OS) maps (Ref 11-50);

11.5.9 Other information required to assess the potential interactions between surface water and groundwater with implications for surface water resources is covered in *Chapter 9: Geology and Hydrogeology* of this ES.

Site Walkovers

11.5.10 An initial site walkover was undertaken on 25 and 26 May 2022 by a surface water specialist and hydromorphologist in warm, dry and fair conditions. The walkover focused on surface water features in the study area, observing their current character and condition, the presence of existing risks and any potential pathways for construction and operational impacts from the Proposed Development.

11.5.11 A second site walkover was undertaken between 27 February – 3 March 2023 by a surface water specialist and a hydromorphologist in cold and wet conditions. The walkover focused on observing the water features that had not been visited in the previous walkover, including the condition and potential impact pathways of construction and operations of the Proposed Development. It also allowed for observations to be taken during different flows and weather conditions.

11.5.12 A summary of the site walkover is provided in *ES Volume IV Appendix 11.2 (Application Document 6.4.11.2).*

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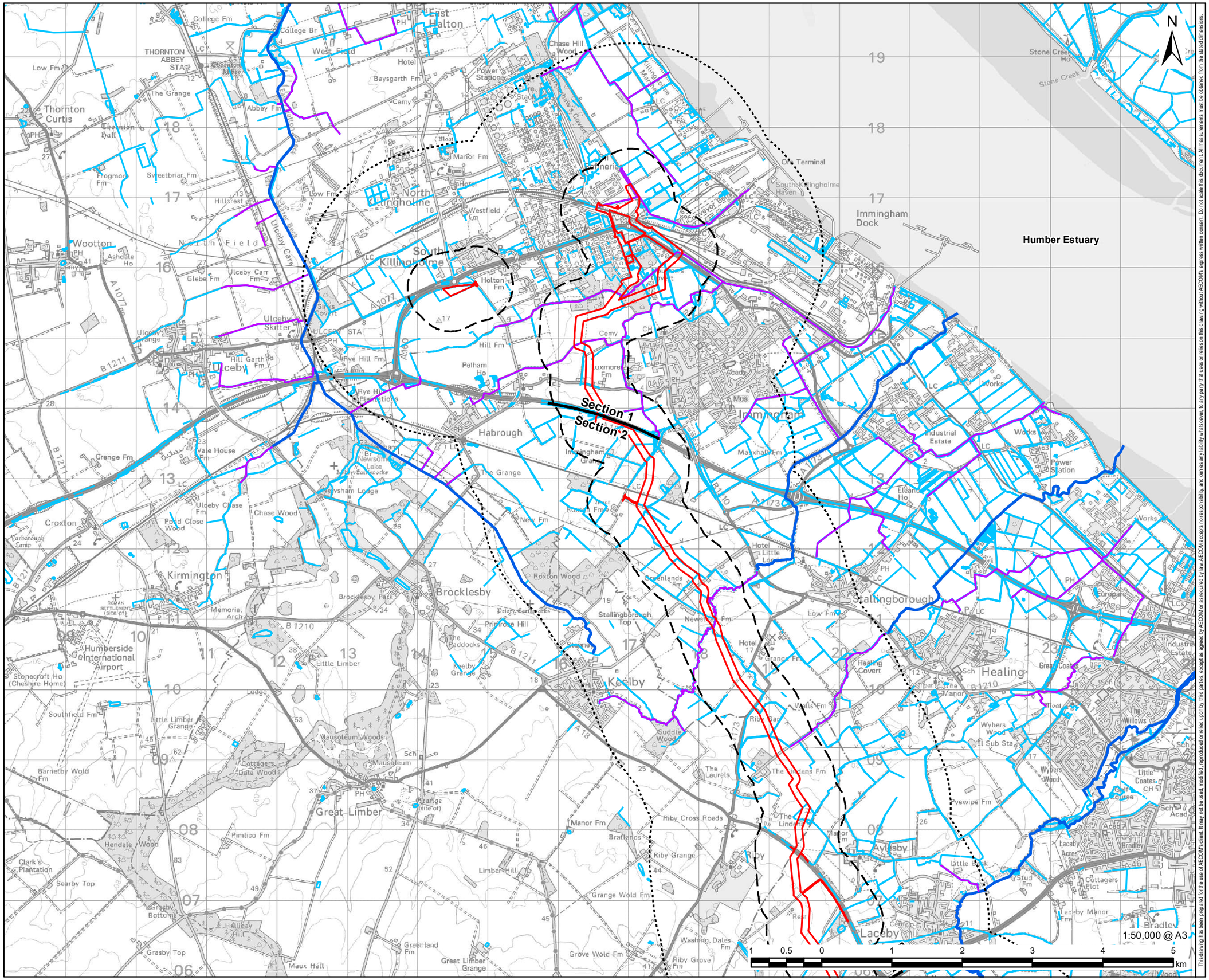

VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break
- IDB Maintained Watercourse
- Ordinary Watercourse
- EA Main River

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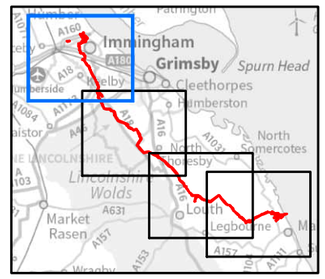

FIGURE TITLE

Figure 11-1 (1 of 4)
Surface Water Features and Study Area

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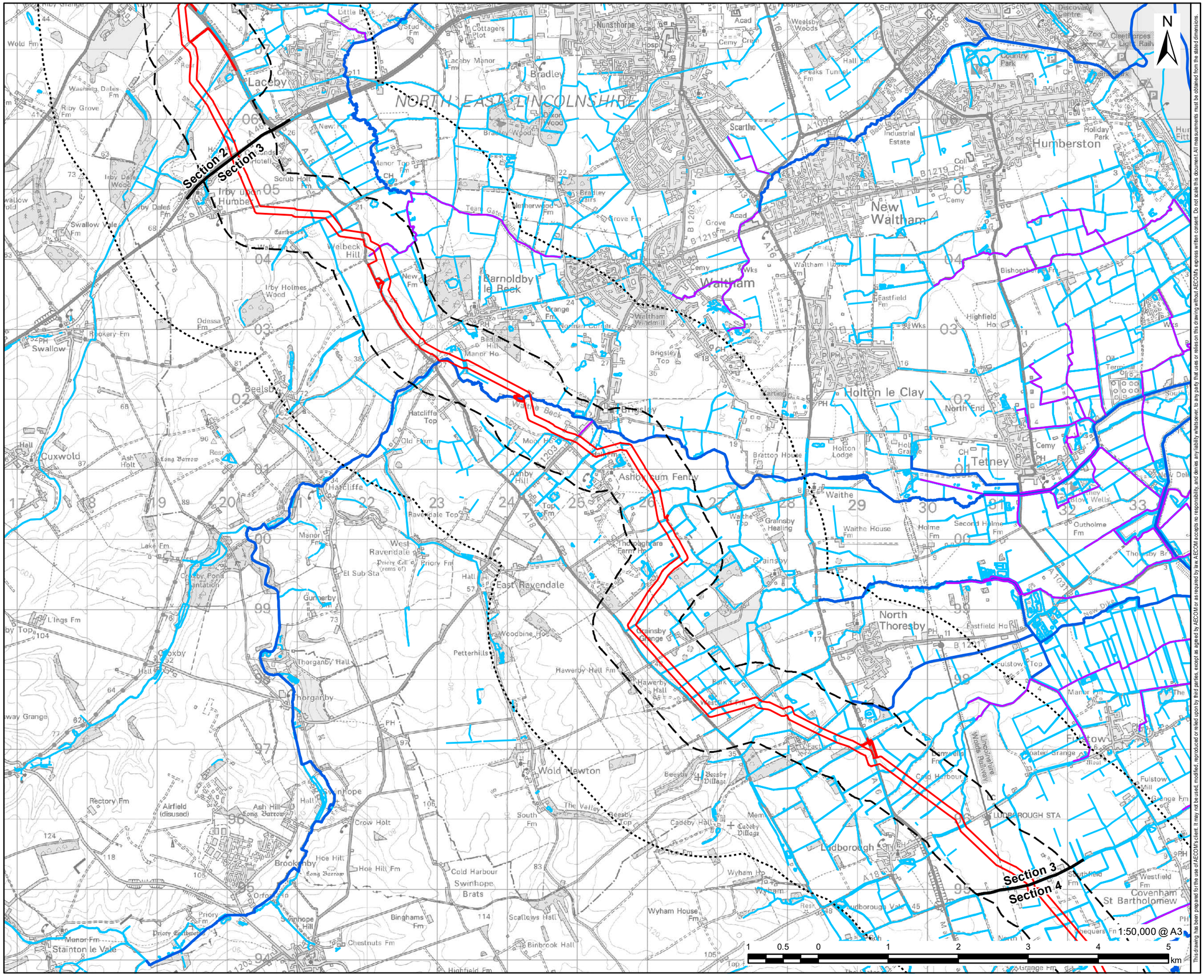

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- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break
- IDB Maintained Watercourse
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- EA Main River

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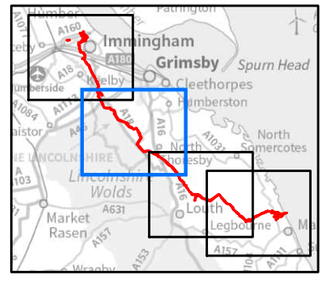

FIGURE TITLE

Figure 11-1 (2 of 4)
Surface Water Features and Study Area

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PROJECT NUMBER / REFERENCE

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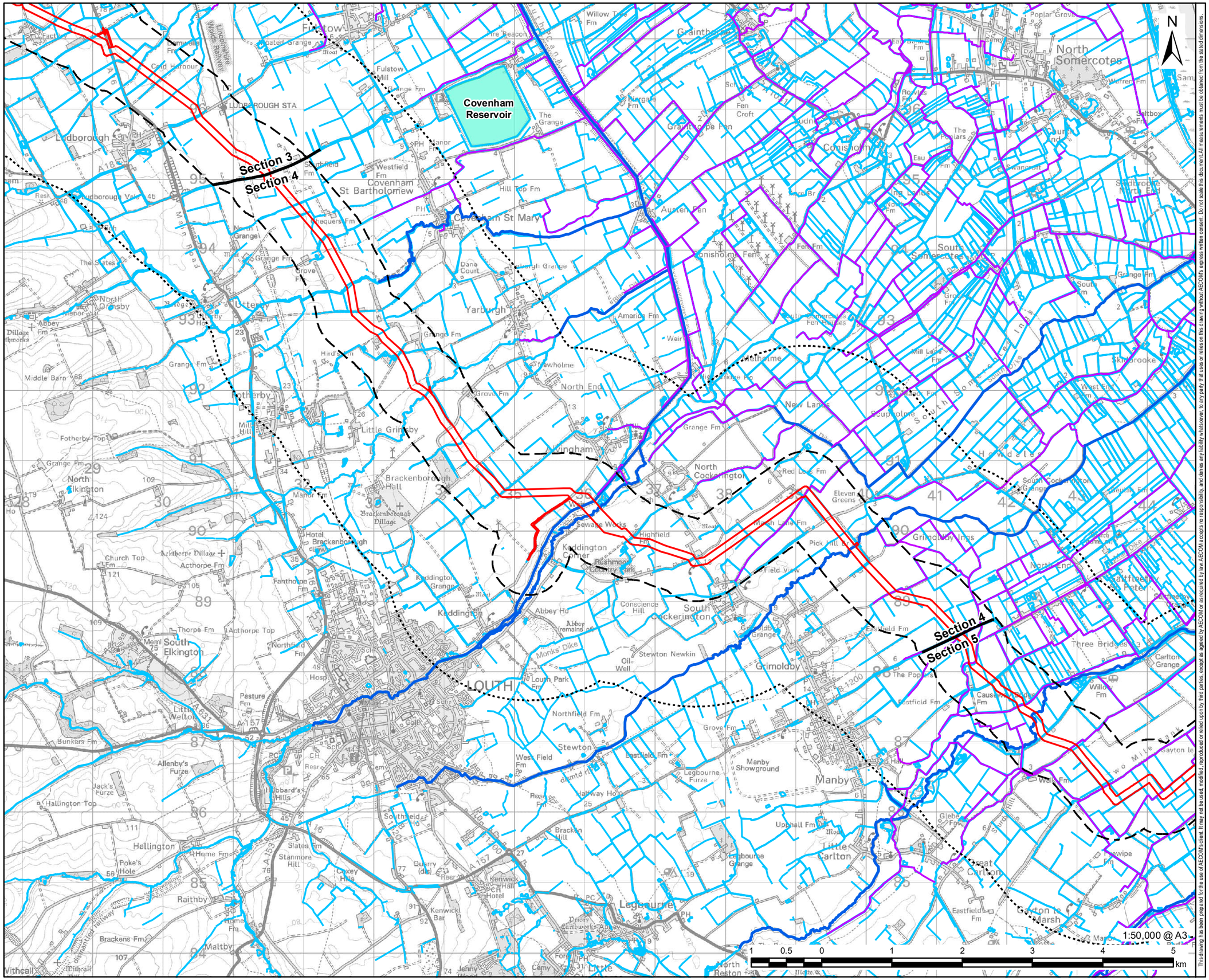

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LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break
- IDB Maintained Watercourse
- Ordinary Watercourse
- EA Main River
- Covenham Reservoir

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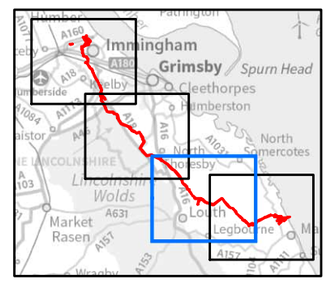

FIGURE TITLE

Figure 11-1 (3 of 4)
Surface Water Features and Study Area

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

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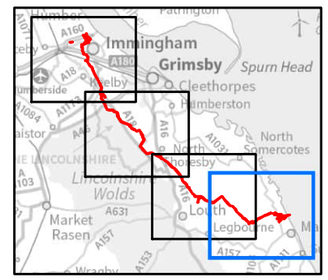

FIGURE TITLE

Figure 11-1 (4 of 4)
Surface Water Features and Study Area

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ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-1

Surface Water Receptors

11.5.13 An overview of the surface water receptors relevant to the assessment are provided in this section.

11.5.14 The Proposed Development has the potential to affect over 100 freshwater surface water features, two coastal waterbodies and a water supply reservoir. **Figure 11-2** shows the receptors and their crossing locations.

11.5.15 The watercourses in the study area are a mix of Main Rivers and Ordinary Watercourses, some of which are managed by internal drainage boards (IDBs). These are discussed in further sections below.

11.5.16 A full list of surface water receptors are given below:

- Humber Estuary– Sections 1-4;
- Lincolnshire Waterbody– Sections 4 and 5;
- North Beck Drain – Section 2;
- Mawnbridge Drain – Section 2;
- Laceby Beck / River Freshney – Section 3;
- Waithe Beck – Section 3;
- New Dike – Section 3;
- Covenham Reservoir – Section 4;
- Poulton Drain – Section 4;
- Black Dyke – Section 4;
- Louth Canal – Section 4;
- South Dike and Grayfleet Drain – Section 4;
- Long Eau – Section 5;
- Great Eau – Section 5;
- Trusthorpe Pump Drain – Section 5;
- Internal Drainage Board water features – Sections 1, 2 and 5;
- Other permanent water features – All sections; and
- Ephemeral and/or artificial drains and ditches, some of which it may not have been possible to identify – All sections.

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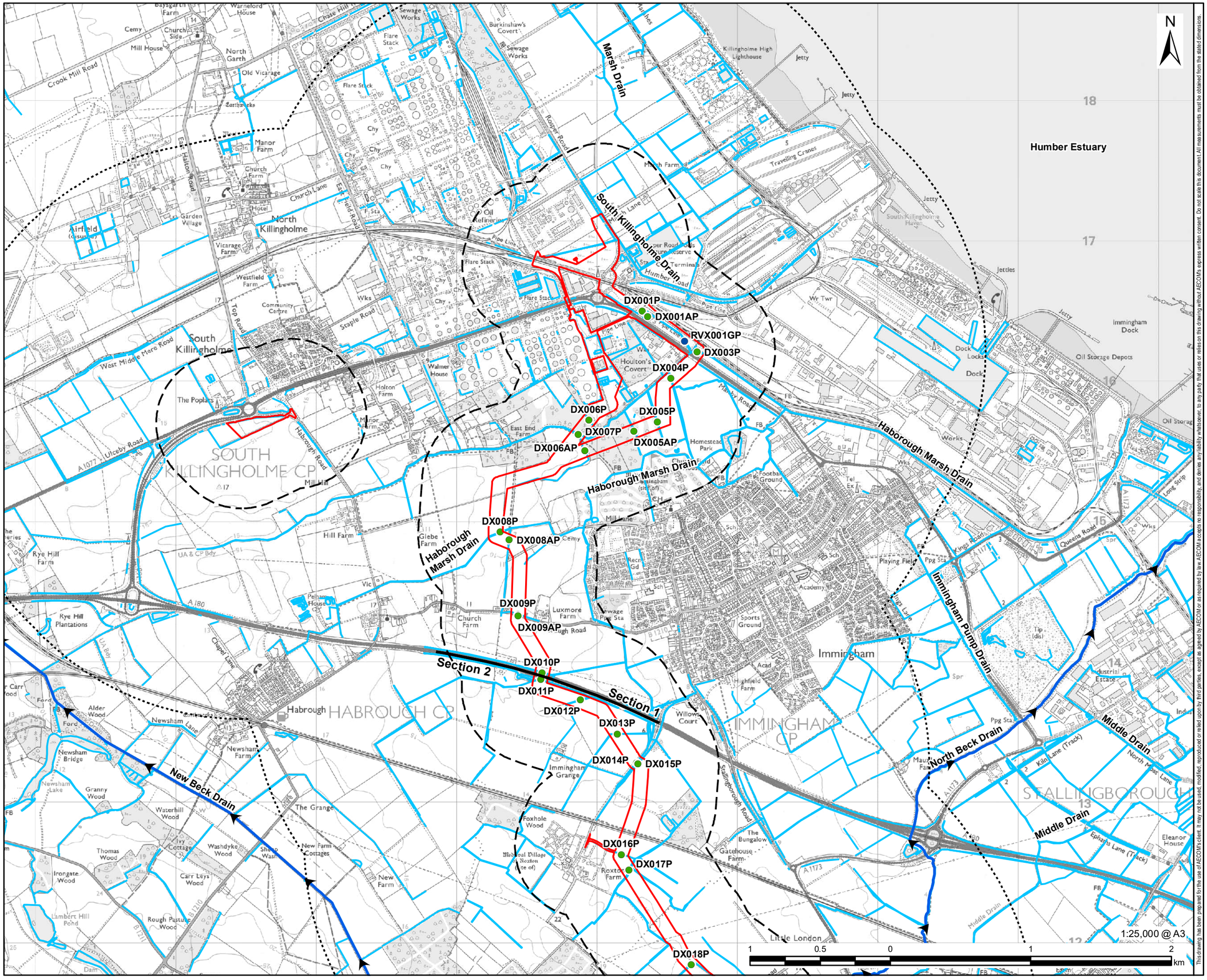

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- Route Section Break
- Ordinary Watercourse
- EA Main River

Crossing Location - Type

- Drain
- River

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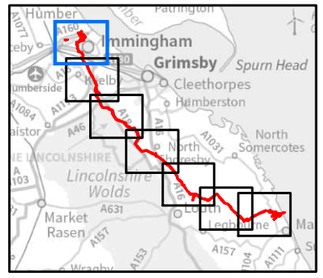

FIGURE TITLE

Figure 11-2 (1 of 7)
Watercourse Details showing Crossing Reference and Flow Direction

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DX023DP
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DX025P
DX026P
DX027P
DX028P

New Beck Drain
North Beck Drain
Middle Drain
Old Fleet Drain
Mawnbridge Drain
North Beck/Caddle Beck
Laceby Beck

HEALING CP
KEELBY CP
AYLESBY CP
RIBY CP
LACEBY CP

Roxton Wood
Stallingborough Top
Keelby
Healing
Stallingborough
Little London
Aylesby
Laceby
Riby

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LEGEND

- DCO Site Boundary
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- EA Main River

Crossing Location - Type

- Drain
- River

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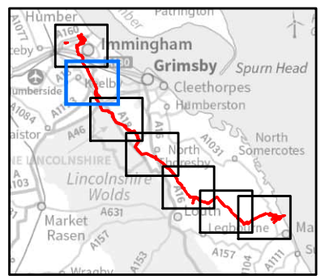

FIGURE TITLE

Figure 11-2 (2 of 7)
Watercourse Details showing Crossing Reference and Flow Direction

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ENVIRONMENTAL STATEMENT

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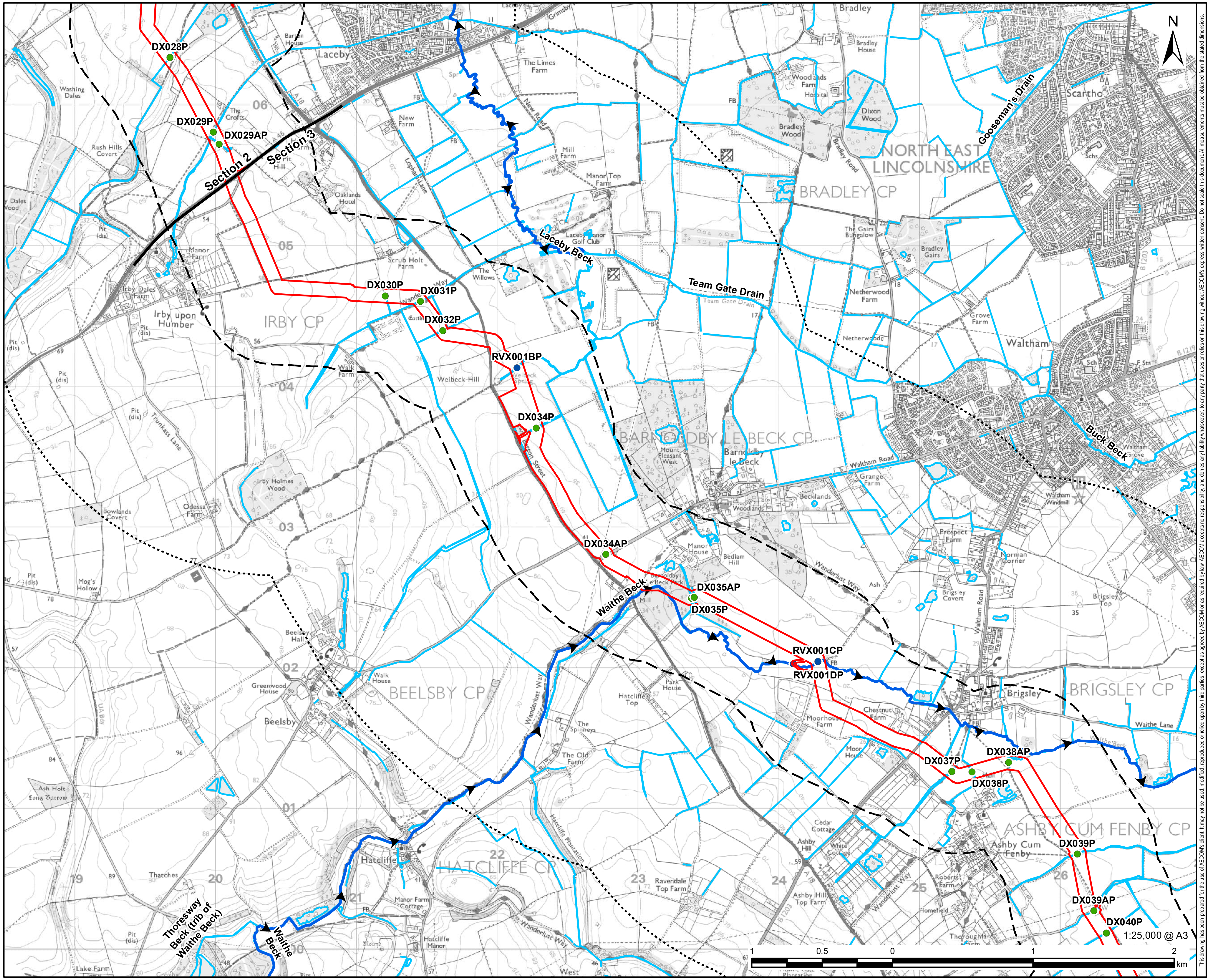

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- Ordinary Watercourse
- EA Main River

Crossing Location - Type

- Drain
- River

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FIGURE TITLE

Figure 11-2 (3 of 7) Watercourse Details showing Crossing Reference and Flow Direction

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ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

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Waithe Beck

Tetney Drain / Mother Drain

Old Fleet Drain (Diversion)

Bond Croft Drain

Black Leg Drain

New Dike / New Dyke

Poulton Drain

DX039P
DX039AP
DX040P
DX041P
DX042P
DX043P
DX044P
DX045P
DX045AP
DX046P
DX046AP
DX047P
DX048P
DX049P
DX049AP
DX050P
DX051P
DX052P
DX053P
DX054P
DX055P
DX056P
DX057P
DX058P
DX059P
DX060P
DX060AP

Section 3
Section 4

ASHBY CUM FENBY CP
WAITHE CP
GRAINSBY CP
WENDALE CP
NORTH THORESBY CP
FULSTOW CP
HAWERBY CUM BEESBY CP
LUDBOROUGH CP
WYHAM CUM CADEBY CP
UTTERBY CP

Ashby Cum Fenby
Waithe
Grainsby
North Thoresby
Hawerby
Beesby
Cadeby
Ludborough
Wyham
Fulstow

1:25,000 @ A3

1 0.5 0 1 2 km

N

VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break
- Ordinary Watercourse
- EA Main River

Crossing Location - Type

- Drain

NOTES:
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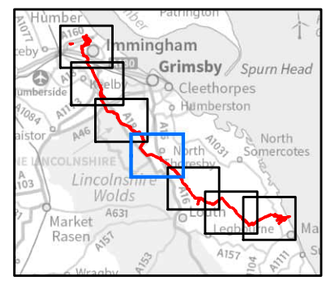

FIGURE TITLE

Figure 11-2 (4 of 7)
Watercourse Details showing Crossing Reference and Flow Direction

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-2

Revision: 3 Drawn: LC Checked: KSB Approved: MW Date: 2023-09-14

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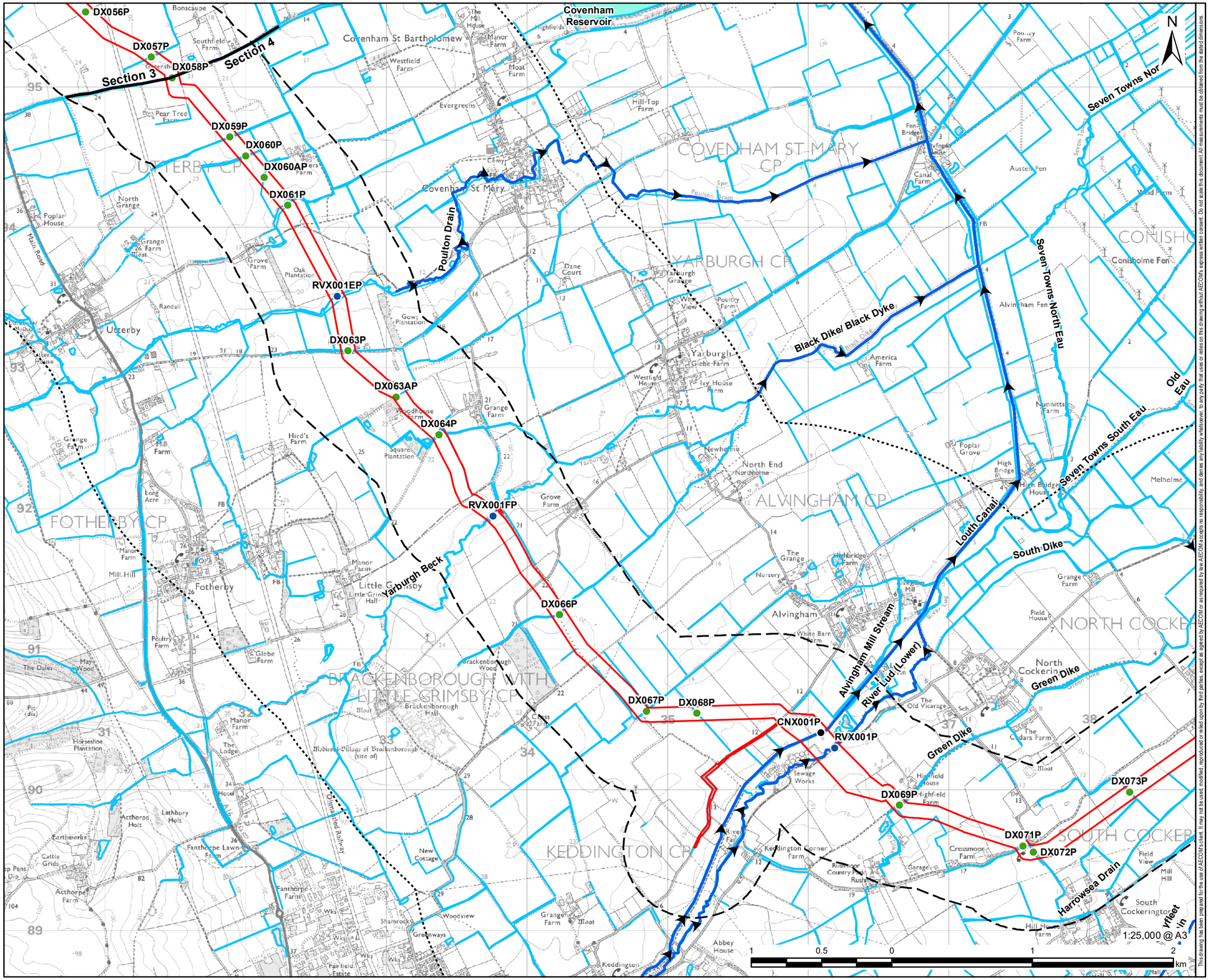

VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break
- Ordinary Watercourse
- EA Main River
- Covenham Reservoir

Crossing Location - Type

- Canal
- Drain
- River

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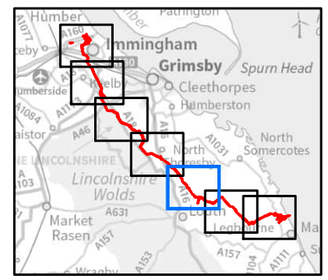

FIGURE TITLE

Figure 11-2 (5 of 7)
Watercourse Details showing Crossing Reference and Flow Direction

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-2

Revision: 3 Drawn: LC Checked: KSB Approved: MW Date: 2023-09-14

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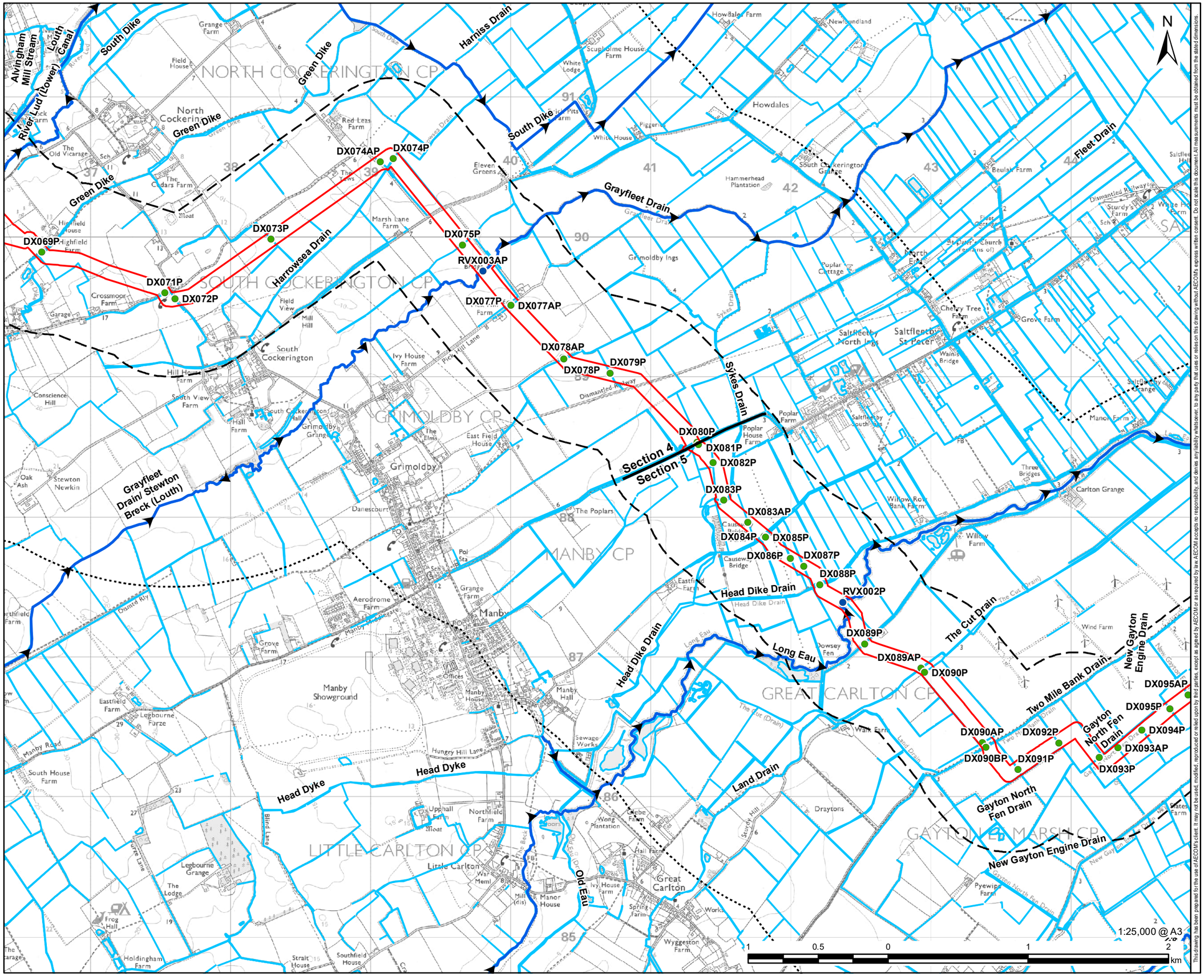

VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break
- Ordinary Watercourse
- EA Main River

Crossing Location - Type

- Drain
- River

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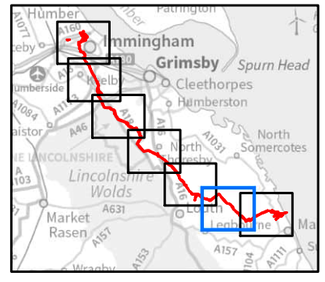


FIGURE TITLE

Figure 11-2 (6 of 7)
Watercourse Details showing Crossing Reference and Flow Direction

ISSUE PURPOSE

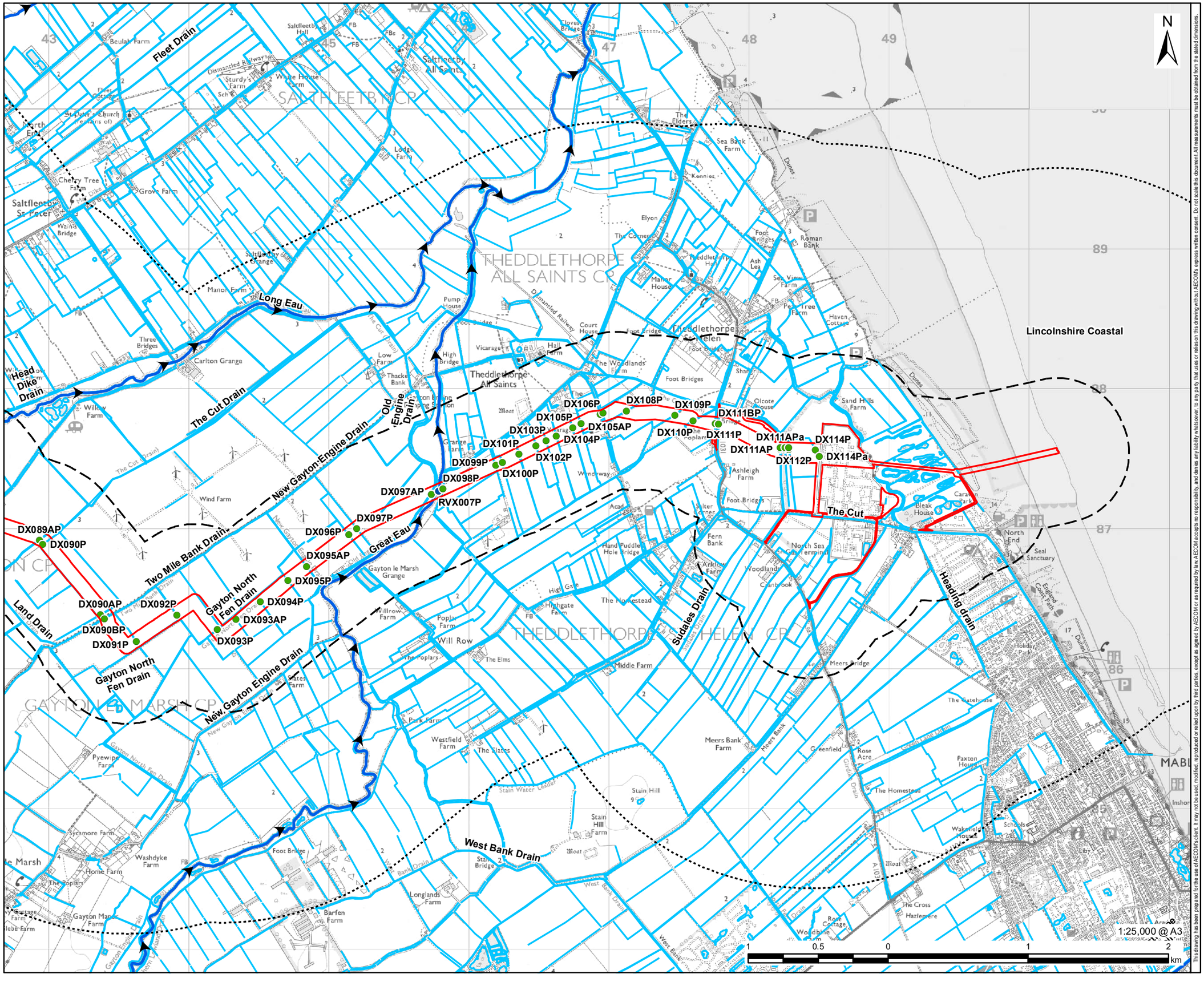
ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-2

Revision: 3 Drawn: LC Checked: KSB Approved: MW Date: 2023-09-14

Filename : \\eu.aecomnet.com\EMIAUK\IUKNCL2\Jobs\60668955 V_Net_Zero_Project\900_CAD_GIS\920_GIS\02_Maps\ES\VCCS_ES_11-2_ Watercourse_Details_v3_20230914_LC.mxd



VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Ordinary Watercourse
- EA Main River

Crossing Location - Type

- Drain
- River

NOTES:

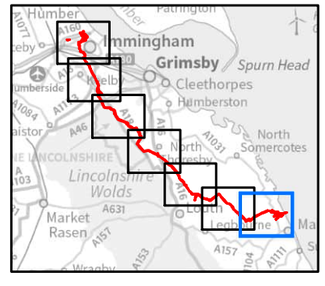


FIGURE TITLE

Figure 11-2 (7 of 7)
Watercourse Details showing Crossing Reference and Flow Direction

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-2

Baseline Conditions

Topography and Land Use

11.5.17 Generally, the topography for the entire study area is relatively flat, with elevations typically ranging from 4m above ordnance datum (AOD) to approximately 50 mAOD within the route sectors. This is due to the Proposed Development's proximity to the coast, which is typically formed of low-lying farmland and marshland.

Section 1

11.5.18 The topography of this section ranges from 2 mAOD towards the northeast of the sector and generally increases westwards towards the Lincolnshire Wolds, at a maximum of 15 mAOD, just south of South Killingholme. The topography is generally flat.

11.5.19 Within the north of the area is dominated by urban to sub-urban land use, associated with the industrial area of Immingham. Throughout Immingham there are small patches of deciduous and coniferous woodland associated with green parks and a golf course (which is not currently in use so is overgrown).

Section 2

11.5.20 The topography associated with this section ranges from approximately 8 mAOD towards the northern part of the section and generally increases south-westwards towards the Lincolnshire Wolds, at a maximum of 50 mAOD. The topography is generally gently sloping towards the east, and there are shallow, wide valleys associated with some of the larger watercourses.

11.5.21 The land use is predominately arable with patches of deciduous woodland throughout.

Section 3

11.5.22 The topography associated with this section is generally gently sloping towards the east, with elevations ranging between 8 mAOD to around 55 mAOD, however the elevation increases and decreases along the section as the DCO Site Boundary turns east and west, and as wide, shallow valleys associated with larger watercourses are encountered.

11.5.23 The elevations is around 50 mAOD in the northernmost part of the section around Irby upon Humber, and then slopes down to below 20 mAOD once the DCO Site Boundaryt turns west to Laceby Beck. The DCO Site Boundary then turn south-west with elevations of around 40mAOD to the west of Barnoldby le Beck, and then decreasing to below 20mAOD as the DCO Site Boundary crosses Waithe Beck. Elevations then remain around 20 mAOD until the DCO Site Boundary turns east to the south of Ashby cum Fenby, when elevations increase to around 40 mAOD parallel Barton Street. As the DCO Site Boundary turn east the elevation again reduces down to around 20mAOD to the southernmost part of section 3.

11.5.24 The land use towards the north of the and south of the section is predominantly arable with sporadic deciduous woodland throughout. There are several small villages within the area including Barnoldby le Beck, Brigsley, Ashby cum Fenby, and Ludborough.

Section 4

11.5.25 The topography associated with this section is generally flat and with a gentle slope towards the west, with some wide, shallow valleys associated with larger watercourses. Elevations range between 7 mAOD and around 25 mAOD. The northern part of the section is generally around 20 mAOD, with some lower lying areas associated with Poulton Drain and Yarburgh Beck. The DCO Site Boundary turn east to the south-west of Alvingham, and elevations reduce to around 10 mAOD for the southern part of the section, with the valley of the River Lud being below 10 mAOD.

11.5.26 The land use is predominately arable with patches of deciduous woodland throughout. There are several small villages within the area including Alvingham, North Cockerington and South Cockerington.

Section 5

11.5.27 The topography associated with this section is flat and low lying, with elevations below 10 mAOD for the entire section, with a minimum of <2 mAOD towards the east where the section comes to terminus towards the coast. Elevations generally reduce from the northern part of section 5 to the south-west.

11.5.28 The land use within this area is primarily arable, similarly to the other sections, with patches of deciduous woodland spread throughout. There are also small patches of sub-urban areas such as the villages of Theddlethorpe St Helen.

Geology, Hydrogeology and Soils

11.5.29 Geology, hydrogeology, and soils is included in the baseline; however, this topic is considered further in *Chapter 9: Geology and Hydrogeology* and *Chapter 10: Agriculture and Soils of this ES (Application Document 6.2.10).*

11.5.30 A review of publicly available BGS geological maps indicates that the study area within this section travels over five different Superficial Deposits (from most present to least):

- Glacial Till (a heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape (diamicton);
- Tidal Flat Deposits (consolidated soft silty clay, with layers of sand, gravel and peat);
- Glaciofluvial Deposits (sand and gravel with rare clay interbeds; often cross-bedded; of glacial origin); Alluvium present in localised channels between Immingham and Aylesby (comprise soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel); and
- Lacustrine Deposits (laminated clay and silt and can contain thin layers of organic material or sand).

Table 11-9: Study Area Geology

Section	Bedrock	Superficial deposits
1	The bedrock geology underlying this section is Chalk of the Burnham Chalk Formation. Comprising white, thinly bedded chalk with common tabular and discontinuous flint bands; sporadic marl seams.	Most of this section is underlain by Glacial Till and Tidal Flat Deposits. There are also small patches of Alluvium associated with watercourse channels.
2	The majority of this section is underlain by Chalk of the Burnham Chalk Formation. Chalk of the Welton Chalk Formation is present and tends to follow the orientation of A18 between Aylesbury and Brigsley. Generally comprising white, massive, or thickly bedded chalk with common flint nodules, lacking tabular flint bands.	The majority of this section is underlain by Glacial Till. Glaciofluvial deposits are also present throughout this sector primarily around Aylesby and Laceby. Lacustrine Deposits are present in patches near the A1173. Finally, Alluvial Deposits are also present around North Beck Drain.
3	Most of the bedrock geology in this section comprises Chalk of the Welton	This section is predominantly underlain by Glacial Till.

Section	Bedrock	Superficial deposits
	Chalk Formation. Chalk of the Burnham Chalk Formation is also present in this section.	Alluvium, Lacustrine and Glaciofluvial Deposits are also present within this sector but form smaller localised features.
4	Bedrock geology in this section comprises Chalk of the Welton Chalk Formation.	Most of this section is underlain by Glacial Till. Lacustrine, Alluvial and Glaciofluvial Deposits are also present within this section.
5	Most of this section is underlain by Chalk of the Welton Chalk Formation. As the section moves East past Great Carlton the bedrock geology is observed to change to Chalk of the Burnham Formation. The Ferriby Chalk Formation is also present where the route diverts towards Keddington.	Most of this section is underlain by Glacial Till and Tidal Flat Deposits. Alluvium is also present in smaller localised channels cross cutting this section between Covenham St Mary and Manby.

Groundwater

11.5.31 Groundwater level monitoring data was received from the Environment Agency from six boreholes. These are shown in *ES Volume IV: Appendix 11.1 (Application Document 6.4.11.1)*.

11.5.32 The underlying chalk aquifers is confined and therefore not likely to be hydraulically connected to surface waters along the entire study area due to the low permeability superficial quaternary deposits overlying the chalk. There may be blow wells of springs in discreet areas within the study area, this is considered within Chapter 9: Geology and Hydrogeology. However, there is observed continuity between the aquifer of the shallow superficial deposits and the watercourses towards the east of the study area.

Rainfall

Section 1, Section 2 and Section 3

11.5.33 The nearest weather monitoring station to these sections is Cleethorpes, Haverstoe Park which is located to the southeast of Grimsby on the Lincolnshire coast. Based on the available data from this weather station (1991 – 2020), it is estimated that the study area is likely to receive an average of 600.71 mm of rainfall per year, with it raining (greater or equal to 1mm of rain) on approximately 119 days per year. This suggests that rainfall in the area is low, and the area can be considered dry, in comparison to most of the United Kingdom (1,163 mm of rainfall per year and 159 days of rain ≥1 mm). Rainfall is highest from mid-autumn to winter; however, the summer is more wet in comparison to the late winter and spring and generally peaking in November, with the least rainfall falling in March on average (*ES Volume IV: Appendix 11.1 Figure 1-2 (Application Document 6.4.11.1)*).

11.5.34 The same weather station reports that the area generally gets around 25 days of air frost a year, distributed across October to April, with the majority (7 days) occurring in December. Using minimum air temperature as a general indicator of air temperatures, frost cover may not be a consideration for the Proposed Development (*ES Volume IV: Appendix 11.1 Figure 1-3 (Application Document 6.4.11.1)*).

Section 4 and Section 5

11.5.35 The nearest weather monitoring station to these sections is Manby, which is located approximately 8 km east from the town of Louth. Based on the available data from this weather station (1991 – 2020), it is estimated that the study area is likely to receive an

average of 635 mm of rainfall per year, with it raining (greater or equal to 1mm of rain) on approximately 119 days per year. This suggests that rainfall in the area is low and the area can be considered dry in comparison to most of the United Kingdom (1,163 mm of rainfall per year and 159 days of rain ≥1 mm). However, in comparison to Cleethorpes weather station, it is slightly wetter. Rainfall is highest from mid-autumn to winter with rainfall peaks in November, with the least rainfall falling in March on average. However, the summers are wetter in comparison to the late winter and spring *(ES Volume IV – Appendix 11.1 Figure 1-4 (Application Document 6.4.11.1)).*

Surface Water Features

11.5.36 Surface watercourses within the study area generally flow from west to east. The northern part of the study area is within Humber River Basin District (RBD) as set out in the Humber River Basin Management Plan (RBMP), and the southern part of the study area is within the Anglian RBD as set out in the Anglian RBMP. The Proposed Development has the potential to affect a total of 15 WFD waterbodies. However, the WFD applies to all surface watercourses within each waterbody catchment including minor tributaries, ditches and surface water drains that are connected to the WFD waterbodies.

11.5.37 The Proposed Development has the potential to affect over 100 water features (see **Figure 11-1***)*. The watercourses in the study area are a mix of Main Rivers and Ordinary Watercourses. Main Rivers are usually larger rivers and streams. The Environment Agency carries out maintenance, improvement, or construction work on Main Rivers to manage flood risk. An Ordinary Watercourse is defined as “every river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) and passage through which water flows and which does not form part of a Main River”. Lead local flood authorities and internal drainage boards have responsibility for flood risk management on Ordinary Watercourses.

11.5.38 Surface watercourses are summarised below based on their WFD assessed waterbody.

11.5.39 Surface water flow for gauged water features is contained in *ES Volume IV: Appendix 11-1: (Application Document 6.4.11.1).*

WFD Water Bodies

11.5.40 The Proposed Development potentially affects (within 500 m study area) 15 WFD surface waterbodies. Eleven of the waterbodies are within the Becks Northern Operational Catchment, and four are within the Steeping and Eaus Operational Catchment. All WFDs are shown in **Table 11-10** and **Figure 11-3**.

11.5.41 The WFD is implemented through RBMPs which set out statutory objectives for river, lake, groundwater, estuarine and coastal waterbodies and summarise the measures needed to achieve them. The study area is covered by the Humber RBMP and Anglian RBMP (published in October 2022 and updated June 2018 respectively).

11.5.42 The status of the WFD surface waterbodies within the study area are detailed in **Figure 11-3** The WFD overall and ecological status is listed according to the current River Basin Management Plan (RBMP), which is RBMP Cycle 3, dated 2021.

Table 11-10: WFD Study Waterbody Status within study area of the DCO Site Boundary (Cycle 3)

Section	Waterbody Name / ID/ Operational catchment	Hydromorphological designation	Current Status/Potential (2019)		Chemical Failing Elements	Reasons for not achieving good status	Objectives	Potential impact pathway
1	Skitter Beck / East Halton Beck / GB104029067655 / Becks Northern	Heavily modified	Biological	Bad	Mercury and its Compounds, Polybrominated diphenyl ethers (PBDE)	Sewage discharge, airports, poor nutrient management, poor livestock management, flood protection structures, groundwater abstraction, barriers – ecological discontinuity, land drainage	Good by 2027	Catchment crosses by DCO Site Boundary of Immingham Facility
			Chemical	Fail				
			Ecological	Bad				
1 and 2	North Beck Drain / GB104029067575 / Becks Northern	Heavily modified	Biological	No data	Mercury and its Compounds, PBDE	Physical modifications, flow	Good by 2027	Catchment crosses the DCO Site Boundary in section 1. Waterbody crossed by the DCO Site Boundary in section 2
			Chemical	Fail				
			Ecological	Moderate				
2	Mawnbridge Drain / GB104029067540 / Becks Northern	Heavily modified	Biological	No data	Mercury and its Compounds, PBDE	Physical modification, flow	Good by 2027	Catchment crosses the DCO Site Boundary
			Chemical	Fail				
			Ecological	Moderate				
2 and 3	Laceby Beck / River Freshney (to N Sea) / GB104029067530 / Becks Northern	Heavily modified	Biological	Bad	Mercury and its Compounds, PBDE	Sewage discharge, poor nutrient management, poor soil management, flood protection – structures, urbanisation, invasive species, groundwater abstraction, barriers – ecological discontinuity, land drainage, trade/industry discharge	Good by 2027 (Ecological) and Moderate by 2033 (Biological)	Catchment crosses the DCO Site Boundary t in section 2. Waterbody crossed by the DCO Site Boundary in section 3
			Chemical	Fail				
			Ecological	Bad				
3	Waithe Beck lower (to Tetney Lock) / GB104029062100 / Becks Northern	Heavily modified	Biological	Good	Mercury and its Compounds, PBDE	Physical modification, flow	Good by 2027	Waterbody crossed by the DCO Site Boundary
			Chemical	Fail				
			Ecological	Moderate				
3	New Dike (trib of Louth Canal) / GB104029062030 / Becks Northern	Heavily modified	Biological	High	Mercury and its Compounds, PBDE	Physical modification	Good by 2027	Catchments crossed by the DCO Site Boundary
			Chemical	Fail				
			Ecological	Moderate				
3	Land Dike Drain to Louth Canal (West) / GB104029062162 / Becks Northern	Heavily modified	Biological	Bad	Mercury and its Compounds, PBDE	Saline or other intrusion, poor nutrient management, natural conditions, land drainage, flow	Good by 2027	Catchments crossed by the DCO Site Boundary
			Chemical	Fail				
			Ecological	Bad				
4	Poulton Drain (trib of Louth Canal) / GB104029062010 / Becks Northern	Heavily modified	Biological	Moderate	Mercury and its Compounds, PBDE	Land drainage, physical modification	Good by 2027	Waterbody crossed by the DCO Site Boundary
			Chemical	Fail				
			Ecological	Moderate				
4	Covenham Reservoir Water Body / GB30432209 / Becks Northern	Artificial	Biological	Moderate	Mercury and Its Compounds, PBDE	Sewage discharge, physical modification	Good by 2027	Downstream of the DCO Site Boundary
			Chemical	Fail				
			Ecological	Moderate				

Section	Waterbody Name / ID/ Operational catchment	Hydromorphological designation	Current Status/Potential (2019)		Chemical Failing Elements	Reasons for not achieving good status	Objectives	Potential impact pathway
4	Black Dyke (trib of Louth Canal) / GB104029062000 / Becks Northern	Heavily modified	Biological	Poor	Mercury and its Compounds, PBDE	Land drainage, physical modification, suspect data	Good by 2027	Waterbody crossed by the DCO Site Boundary
			Chemical	Fail				
			Ecological	Moderate				
4	Louth Canal / GB104029061990 / Becks Northern	Heavily modified	Biological	Poor	Mercury and its Compounds, PFOS[1], PBDE.	Sewage discharge (continuous), urbanisation, poor livestock management, land drainage, presence of invasive species	Moderate by 2027	Waterbody crossed by the DCO Site Boundary
			Chemical	Fail				
			Ecological	Poor				
4	South Dike and Grayfleet Drain / GB105029061680 / Steeping and Eaus	Heavily modified	Biological	Bad	Mercury and its Compounds, PBDE	Physical modification	Good by 2027	Waterbody crossed by the DCO Site Boundary
			Chemical	Fail				
			Ecological	Moderate				
5	Long Eau / GB105029061670 / Steeping and Eaus	Heavily modified	Biological	Poor	Mercury and its Compounds, PBDE	Poor livestock management, sewage discharge (continuous), poor soil management, urbanisation, land drainage, poor nutrient management, physical modification	Good by 2027	Waterbody crossed by the DCO Site Boundary
			Chemical	Fail				
			Ecological	Moderate				
5	Great Eau (d/s of South Thoresby) / GB105029061660 / Steeping and Eaus	Heavily modified	Biological	Poor	Mercury and its Compounds, PBDE	Poor nutrient management, poor livestock management, barriers – ecological discontinuity, flow, trade/industry discharge, physical modification, poor soil management, presence of invasive species	Good by 2027	Waterbody crossed by the DCO Site Boundary
			Chemical	Fail				
			Ecological	Poor				
5	Trusthorpe Pump Drain (upper end) / GB105029061640 / Steeping and Eaus	Artificial	Biological	Good	Mercury and its Compounds, PBDE	Sewage discharge (intermittent)	Good by 2027	Catchment crossed by the DCO Site Boundary
			Chemical	Fail				
			Ecological	Moderate				

[1] Perfluorooctane sulphonate (PFOS)

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North Killingholme Haven Pits

Humber Lower

North Beck Drain

Section 1

Section 2

Skitter Beck / East Halton Beck

Mawnbridge Drain

Laceby Beck / River Freshney Catchment (to N Sea)

1:50,000 @ A3

1 0.5 0 1 2 3 4 5 km

VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break

WFD River, Canal and Surface Water Transfer Waterbody

Ecological Classification

- Moderate
- Poor
- Bad

WFD River Waterbody Catchment Boundary

Ecological Classification

- Moderate
- Poor
- Bad

WFD Transitional and Coastal Waterbody

Ecological Classification

- Moderate

NOTES:

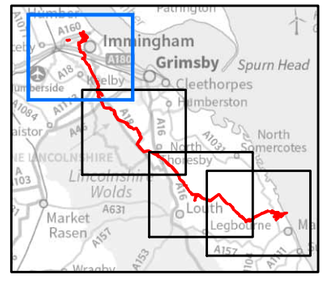

FIGURE TITLE

Figure 11-3 (1 of 4)
WFD Surface Waterbodies

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-3

North Beck Drain

Mawnbridge Drain

Section 2

Section 3

Laceby Beck / River Freshney Catchment (to N Sea)

Buck Beck from Source to N Sea

Waithe Beck lower catchment (to Tetney Lock)

New Dike Catchment (trib of Louth Canal)

Land Dike Drain to Louth Canal (West)

Section 3

Section 4

Poulton Drain Catchment (trib of Louth Canal)

Louth Canal

Humber

NORTH EAST LINCOLNSHIRE

1 0.5 0 1 2 3 4 5 km

1:50,000 @ A3

VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break

WFD River, Canal and Surface Water Transfer Waterbody

Ecological Classification

- Moderate
- Poor
- Bad

WFD River Waterbody Catchment Boundary

Ecological Classification

- Moderate
- Poor
- Bad

WFD Transitional and Coastal Waterbody

Ecological Classification

- Moderate

NOTES:

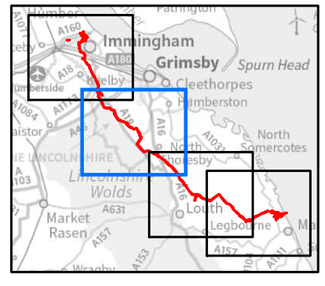

FIGURE TITLE

Figure 11-3 (2 of 4)
WFD Surface Waterbodies

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-3

New Dike Catchment (trib of Louth Canal)

Land Dike Drain to Louth Canal (West)

Section 3

Section 4

Poulton Drain Catchment (trib of Louth Canal)

Black Dyke Catchment (trib of Louth Canal)

Louth Canal

South Dike and Grayfleet Drain

Section 4

Section 5

Great Eau (downstream of South Thoresby)

Long Eau

1:50,000 @ A3

1 0.5 0 1 2 3 4 5 km

N

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break

WFD River, Canal and Surface Water Transfer Waterbody

Ecological Classification

- Good
- Moderate
- Poor

WFD River Waterbody Catchment Boundary

Ecological Classification

- Good
- Moderate
- Poor
- Bad

NOTES:

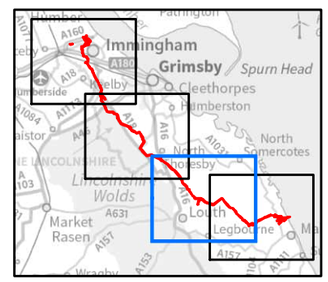

FIGURE TITLE

Figure 11-3 (3 of 4)
WFD Surface Waterbodies

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-3

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Revision: 4 Drawn: LC Checked: KSB Approved: MW Date: 2023-09-14

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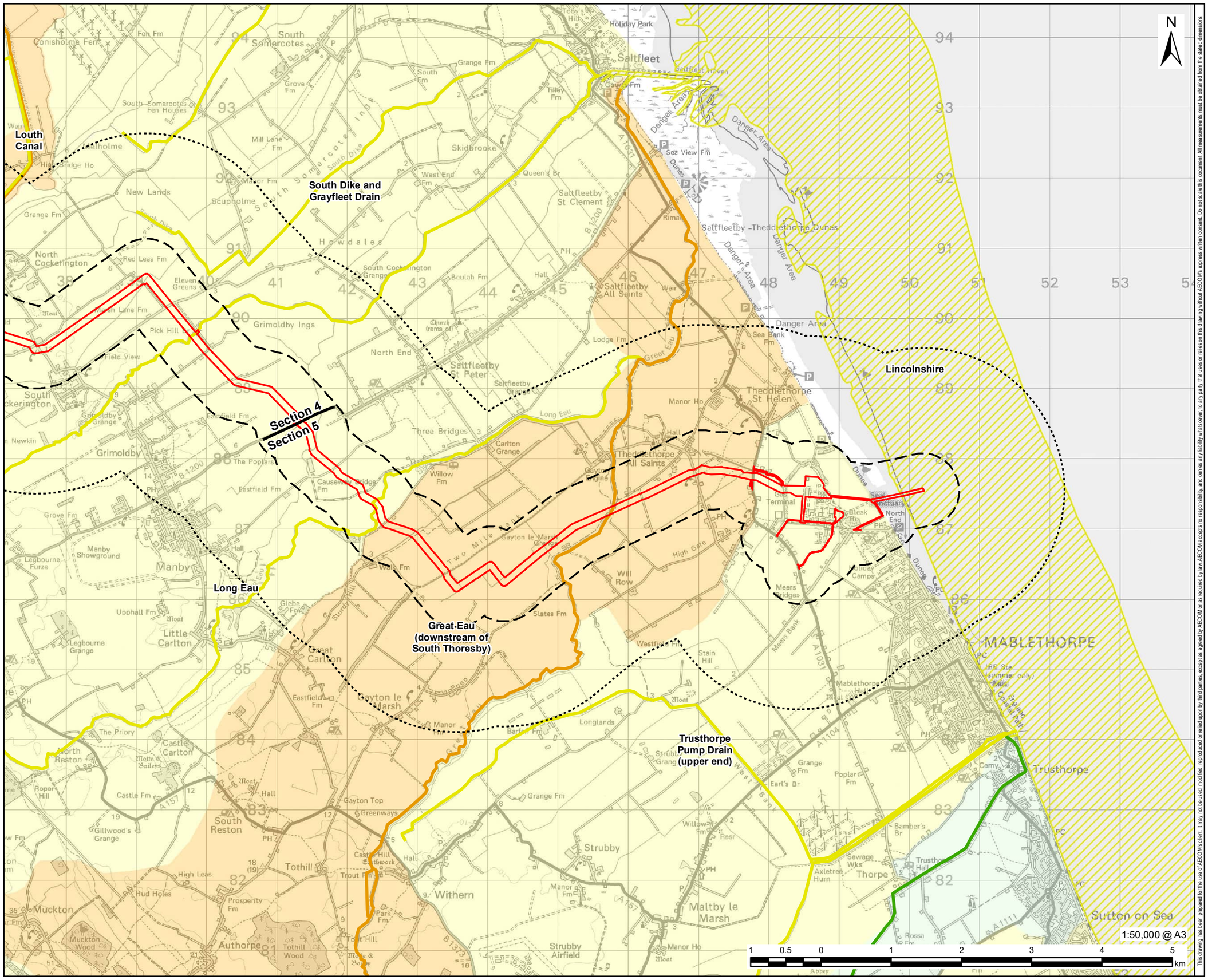

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break

WFD River, Canal and Surface Water Transfer Waterbody

Ecological Classification

- Good
- Moderate
- Poor

WFD River Waterbody Catchment Boundary

Ecological Classification

- Good
- Moderate
- Poor

WFD Transitional and Coastal Waterbody

Ecological Classification

- Moderate

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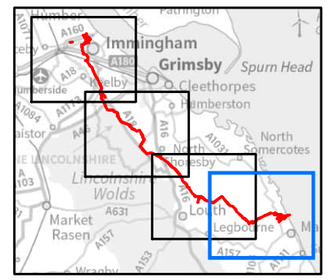

FIGURE TITLE

Figure 11-3 (4 of 4)
WFD Surface Waterbodies

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-3

Main Rivers

11.5.43 The Proposed Development crosses six watercourses classified as a Main River by the Environment Agency, with a further six located within 500 m of the DCO Site Boundary which are connected to a watercourse that is potentially impacted by the Proposed Development. The Main Rivers potentially impacted by the Proposed Development are listed in **Table 11-11**Table 11-11 and shown in Table 11-11**Figure 11-1**.

Table 11-11: Main Rivers Potentially Impacted by the Proposed Development

River Name	Description
Section 1	
There are no Main Rivers in Section 1	
Section 2	
North Beck Drain	North Beck Drain is crossed by the DCO Site Boundary where the watercourse is classified as an Ordinary Watercourse, the river is classified as a Main River approximately 1 km downstream of the route (Main River not crossed by DCO Site Boundary). The River originates in Suddle Wood and flows in a north-easterly direction to the Humber Estuary.
Section 3	
Laceby Beck / River Freshney	Laceby Beck / River Freshney is crossed by the DCO Site Boundary where the watercourse is classified as an Ordinary Watercourse, the river is classified as a Main River approximately 900 m downstream of the route (Main River not crossed by DCO Site Boundary). Laceby Beck originates at Laceby Golf club and flows in a northerly direction to Laceby, and then in a north-easterly direction to Grimsby where it becomes the River Freshney. The river flows through Grimsby to the Humber estuary via the Grimsby Docks.
Waithe Beck	Waithe Beck is crossed by the DCO Site Boundary where the watercourse is a Main River. Waithe Beck flows initially northwards from TF 1879 9399 through the villages of Brookenby, Thorganby, and Hatcliffe, at which point it turns to the east and is crossed by the DCO Site Boundary (TA 24311 02054). At TA 3080 0065 it then flows into Tetney Drain, which eventually discharges into the North Sea via Louth Canal at TA 3354 0783.
Black Leg Drain	Black Leg drain is within 500 m of the DCO Site Boundary. (Main River not crossed by DCO Site Boundary). The watercourse originates to the south of North Thoresby, and flows in a north-easterly direction to New Dike, which then flows into the Louth Canal.
Section 4	
Poulton Drain	Poulton Drain is crossed by the DCO Site Boundary where the watercourse is classified as an Ordinary Watercourse, the river is classified as a Main River approximately 400 m downstream of the route (Main River not crossed by DCO Site Boundary). Poulton Drain approaches the village of Covenham St Mary from the southwest, entering the sector at TF 32653 93515, just downstream of the village. Downstream of the village, it flows approximately 2 km further and enters Louth Canal at TF 3683 9461.

River Name	Description
Black Dike	Black Dike (also known at Yarburgh Beck) is crossed by the DCO Site Boundary where the watercourse is classified as an Ordinary Watercourse, the river is classified as a Main River approximately 2 km downstream of the route (Main River not crossed by DCO Site Boundary). The watercourse originates south of Little Grimsby where it is known as Yarburgh Beck (ordinary watercourse) which flows in a north-easterly direction across the DCO Site Boundary, following which it becomes Black Dike. Black Dike flows into Louth Canal at TF 3716 9373.
Louth Canal	Louth Canal is crossed by the DCO Site Boundary where the watercourse is a Main River. Louth Canal begins in the town of Louth at TF 3212 8724. It flows through the canal and then north and east, through the section at TF 3628 9060, and is joined by numerous rivers and drains and discharges to the North Sea at TA 3354 0783.
River Lud	The River Lud is crossed by the DCO Site Boundary where the watercourse is a Main River. The Lud flows within Louth Canal through the town of Louth, but then splits shortly after at TF 34552 88439. From this point, it runs alongside the canal, crossing into the sector at TF 3639 9049. After passing through the section, it continues to flow alongside the canal and then splits into the Seven Towns North Eau and the Old Eau at the Eau Meet, just to the southeast of Alvingham.
Grayfleet Drain	Grayfleet Drain is crossed by the DCO Site Boundary where the watercourse is a Main River. Grayfleet Drain rises in the south of Louth at TF 3333 8636 and flows northeast, bisecting the villages of South Cockerington and Grimoldby, just before entering the section at TF 39824 89773. It then continues northeast, discharging into the North Sea at Saltfleet at TF 46963 93507.
Section 5	
Long Eau	Long Eau is crossed by the DCO Site Boundary where the watercourse is a Main River. Rising to the east of Legbourne (TF 3574 8373), the Long Eau flows eastwards towards and past the village of Little Carlton, entering the section at TF 4235 8717. Once through the section, it continues flowing east, eventually joining the Great Eau at TF 4613 8939.
Great Eau	Great Eau is crossed by the DCO Site Boundary where the watercourse is a Main River. The Great Eau flows northeast from TF 4028 7778, past Claythorpe and Withern and into the section at TF 45789 87279. It then continues northeast, is joined by the Long Eau at TF 4613 8939, and then discharges into the North Sea at Saltfleet at TF 46963 93507.

Ordinary Watercourses

11.5.44 In addition to these, an initial review indicates that there is likely to be over one hundred Ordinary Watercourses crossed by, or within 500 m of, the DCO Site Boundary. An initial review of these has been undertaken based on the OS Open Rivers data, the MAGIC map (Ref 11-38) and OS online mapping (Ref 11-50). Ordinary Watercourses are all channels through which water may flow at times that are not designated as a Main River. These Ordinary Watercourses are likely to include natural streams, drainage dikes, field drains and other artificial water features.

11.5.45 There is also the possibility that many of these Ordinary Watercourses are likely to be intermittently flowing or ephemeral along the DCO Site Boundary. These have been identified (where reasonably practical to do so) following site visits summarised in *ES Volume IV: Appendix 11.2 (Application Document 6.4.11.2).* However, it will not be possible to identify all of the smallest, minor and temporary ditches and thus the ES includes a general impact assessment to cover all of these minor features. More detailed pre-construction surveys would locate them and ensure that the suite of mitigation that will be described in the ES can be appropriately applied.

Standing Water Features

11.5.46 The Proposed Development's DCO Site Boundary has the potential to impact upon a large number of standing water features. These water features generally comprise small farm or water treatment ponds, and none of these water features is designated as a lake under the WFD.

11.5.47 The DCO Site Boundary (Section 4) is located 1.5 km west, and upstream of, the Covenham Reservoir, and therefore has the potential to be impacted indirectly by the Proposed Development. This is a 218 ha reservoir acts as storage for times of low aquifer recharge. It hosts a water sports centre for recreational use such as sailing, water-skiing and diving. The perimeter is bordered by a public walkway. It is fed by Louth Canal which is being crossed by the DCO Site Boundary directly.

11.5.48 A full database and maps of standing water features has been developed for *Chapter 6: Ecology and Biodiversity,* of this ES.

Internal Drainage Boards

11.5.49 Internal Drainage Boards are public bodies that manage water level and reduce the risk from flooding within an area (known as the internal drainage district), where there is specific need for drainage.

11.5.50 The DCO Site Boundary crosses two internal drainage boards (IDB): North East Lindsey IDB which covers the coastal area around Immingham; and Lindsey Marsh Drainage Board, which covers the coastal area around Theddlethorpe.

11.5.51 North East Lindsey IDB extends over an area of 112.5 km^2 and covers the coastal area that extends from the Humber bridge southwards towards Grimsby. The board is responsible for a total of 130 km of watercourse of which 27 km are vital to the protection of intensely developed areas. Lindsey Drainage Board has the largest concentration of industry including petrochemical plants and other industrial complexes.

11.5.52 Lindsey Marsh Drainage Board is the largest drainage board in England, extending over an area 527.57 km^2 of covering a total 938 km of watercourse and 30 pumping stations.

11.5.53 Watercourses within the 500m buffer around the DCO Site Boundary that pertain to IDB are shown in **Table 11-12**.

Table 11-12: Internal Drainage Board Water Features

IDB watercourses crossed by DCO Site Boundary	Other IDB watercourses within 500m	IDB
Section 1		
Habrough Marsh Drain Branch 4	Habrough Marsh Drain Branch 2; South Killingholme Drain; Habrough Marsh Drain Branch 2, Habrough Marsh Drain Branch 1	North East Lindsey
Habrough Marsh Drain Branch 3		
South Killingholme Drain Branch 1		
Section 2		
North Beck/Caddle Beck	Old Fleet Drain	North East Lindsey
Section 3		
Laceby Beck	Brigsley Village Drain	North East Lindsey
		Lindsey Marsh
Section 4		
Harrowsea Drain	Upper South Drain; Mill Stream; Green Dyke; Howdales Drain; Old North Drain; Fleet Drain; Sykes Drain	Lindsey Marsh
Middle Sykes Road Sewer		
Manby Middlegate Drain		
Section 5		
Manby Middle Drain	Sykes Drain, Little Mardyke Branch, Little Mardyke Connection Drain, Saltfleetby South Ings Drain, Dowsey Fen Drain, Carlton Land Drain, Old Highland Drain, Beangare Drain, Grove Road Drain Diversion, Butt Lane Drain, Middle Drain, Highgate Drain, West Drain, Crook Bank Drain East Branch, Mardyke Drain, Millfield Drain, Plough Lane Drain, Sudales Drain, Crook Bank Drain West, Meers Bank North Drain, Scarsbridge Sewer East, Scarsbridge Sewer West, Meers Bank South Drain, Mablethorpe Urban Cut, Heading Drain	Lindsey Marsh
Little Mardyke		
Head Dyke		
Mablethorpe Middle Cut (The Cut Drain)		
Two Mile Bank Drain		
Gayton North Fen Drain		
New Gayton Engine Drain		
Old Engine Drain		
Grove Road Drain		
Mill and Harps Drain		
Rotten Row Drain		
Mablethorpe Lower Cut (The Cut)		

Coastal and estuarine receptors

11.5.54 The Proposed Development is hydrologically connected to two WFD coastal and estuarine watercourses which are detailed in **Table 11-13**.

Table 11-13: Coastal and Estuarine Receptors

Waterbody	Waterbody type	Current Status / Potential		Hydromorph- ological Designation	Designated Reach
Humber Lower Waterbody (GB530402609201)	Transitional water	Ecological	Moderate	Heavily modified	The Humber Lower waterbody stretches from central Hull to Donna Nook, a point on the north Lincolnshire coast. It covers an area of approximately 247 km2.
		Chemical	Fail		
Lincolnshire Waterbody (GB640402492000)	Coastal water	Ecological	Moderate	Heavily modified	The Lincolnshire waterbody stretches from the edge of the Humber Lower waterbody along the coast of Lincolnshire towards Skegness. It covers an area of approximately 170 km2.
		Chemical	Fail		

Water Quality

11.5.55 The Environment Agency's Water Quality Archive website contains surface water quality data for several water features that either lie within the DCO Site Boundary or are hydraulically connected to a water feature that lies within. The summary water quality data from stations within or near the study area are presented in *ES Volume IV: Appendix 11.1 (Application Document 6.4.11.1)*.

Aquatic Ecology and Designated Sites

11.5.56 It is important that any water dependent nature conservation sites and protected species are identified for each water feature receptor so that they may be considered by the impact assessment (i.e., a water feature that has a higher conservation status will be considered a more important and potentially sensitive receptor).

11.5.57 Aquatic ecology data from the Environment Agency has shown that a total of nine monitoring points have been surveyed across the catchments within the study area and the 500 m buffer from 2017 – 2022 (noting that no data from 2023 has been published), these are shown in *ES Volume IV: Appendix 11.1 (Application Document 6.4.11.1).*

11.5.58 Within the study area, there are no designated protected areas within Sections 1-4 including: Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs), National Nature Reserves (NNRs) or Local Nature Reserves (LNRs).

11.5.59 There are several nationally and internationally significant ecologically designated sites within the Section 5 study area *(see Figure 11-9, ES Volume IV: Appendix 11.1 (Application Document 6.4.11.1)):*

- Humber Estuary Ramsar, Special Protection Area (SPA) and Special Area of Conservation (SAC) - located approximately 0.55 km east of the Section 1. The Humber Estuary supports nationally important habitats including intertidal mudflats and sandflats, coastal saltmarsh and associated saline lagoons, sand dunes and standing

waters. The estuary supports nationally important numbers of 22 wintering waterfowl and nine passage waders, and a nationally important assemblage of breeding birds of lowland open waters and their margins. It is also nationally important for a breeding colony of grey seal, river lamprey and sea lamprey, a vascular plant assemblage and an invertebrate assemblage.

- Saltfleetby-Theddlethorpe Dunes & Gibraltar Point SSSI, SAC and National Nature Reserve (NNR), located along the north-east coast of Lincolnshire which stretches for a total length of 8 km. Includes flats, dunes, salt and freshwater marsh support an exceptionally rich flora and fauna. There are outstanding assemblages of vascular plants, invertebrates and breeding birds and it is the most north-easterly breeding site in Britain for the Natterjack Toad. The intertidal sands and muds provide extensive feeding and roosting grounds for wildfowl and waders including brent geese, shelduck and dunlin.

11.5.60 There are also several chalk streams within the study area, based on Natural England mapping (Ref 11-49). Chalk streams are a rare and valuable habitat that have recently garnered much national attention in regard to their conservation. The chalk streams within the area are:

- North Beck Drain;
- Laceby Beck; and
- Waithe Beck.
- Long Eau (upstream of study area)
- Great Eau (upstream of study area)

Water Resources

11.5.61 Water resources within the study area are summarised in **Table 11-14** and shown on **Figure 11-4.**

Table 11-14: Water Resources within Study Area

Water Resources within the Study Area
Section 1
This section contains three Source Protection Zones (SPZ) within 500 m of the DCO Site Boundary: • Zone I – both Inner and Outer Protection Zone, present from Immingham Docks to Immingham town; • Zone II – Outer Protection Zone, present from southern Immingham Docks to the south of Immingham; • Zone III – both Inner and Outer Protection Zone, present across all the section. There are no Drinking Water Safeguard Zones (Surface Water) within this section. This section is within a Nitrate Vulnerable Zone (NVZ) and can be split up into three sub zones (2017): • Surface Water S359 – North Beck Drain NVZ; and • Surface Water S361 – Skitter Beck / East Halton Beck NVZ.
Section 2
This section of contains one SPZ within 1 km of the DCO Site Boundary: • Zone I – both Inner and Outer Protection Zone, surrounding Little London;

Water Resources within the Study Area
• Zone II – Outer Protection Zone, present from western Grimsby to eastern Great Limber; and • Zone III – both Inner and Outer Protection Zone, present between Immingham and Aylesbury. This section contains no Drinking Water Safeguard Zones (Surface Water): This section is within a NVZ and can be split up into three sub zones (2017): • Surface Water S359 – North Beck Drain NVZ; • Surface Water S361 – Skitter Beck / East Halton Beck NVZ; and • Surface Water S357 – Laceby Beck / River Freshney Catchment (to N Sea) NVZ.
Section 3
This section of contains two SPZs within 1 km of the DCO Site Boundary: • Zone I – Outer Protection Zone, present to the northeast of Ludborough; • Zone II – Outer Protection Zone, present from North Thoresby to Ashby cum Fenby and from south of Ashby cum Fenby to Ludborough; and • Zone III – Outer Protection Zone, present throughout entire section. Within this section of the DCO Site Boundary there are four Drinking Water Safeguard Zones (Ground Water): • Ref: GWSGZ0015 – Land from beginning of sector to Barnoldby le Beck; • Ref: GWSGZ0282 – Land surrounding Brigsley; • Ref: GWSGZ0288 – Present between Brigsley and Ashby cum Fenby; and • Ref: GWSGZ0285 – Present between Keelby and Aylesby. From Barnoldby le Beck, the entire of this sector is within a Drinking Water Safeguard Zones (Surface Water) ref: SWSGZ1001. This section is within a NVZ and can be split up into three sub zones (2017): • Surface Water S357 – Laceby Beck / River Freshney Catchment (to N Sea) NVZ; • Surface Water S354 – Waithe Beck lower catchment (to Tetney Lock) NVZ; • Surface Water S353 – Louth Canal NVZ.
Section 4
There are no SPZs within 1km of the DCO Site Boundary. All of this section is within a Drinking Water Safeguard Zones (Surface Water) up until North Cockerington ref: SWSGZ1001. This section is within two NVZ and can be split up into one sub zones (2017): • Surface Water S353 – Louth Canal NVZ • Surface Water S366 – South Dike and Grayfleet Drain NVZ Whilst Covenham Reservoir lies outside of the study area, due to its proximity to the boundary, it is considered within scope and therefore included in this assessment.
Section 5
There are no SPZs within 1km of the DCO Site Boundary. Within this section of the DCO Site Boundary there are no Drinking Water Safeguard Zones (Ground Water) This section is within one Drinking Water Safeguard Zones (Surface Water) • Ref: SWSGZ1002 Louth Canal, Great Eau and Covenham Reservoir

Water Resources within the Study Area
This section is within a NVZ and can be split up into two sub zones (2017): • Surface Water S365 – Great Eau (downstream of South Thoresby) NVZ; and • Surface Water S363 – Woldgrift Drain NVZ.

Abstractions

11.5.62 Within the 500m buffer of the DCO Site Boundary there two groundwater abstraction licenses (4/29/09/*G/0045 and 4/29/14/*G/0114) and one surface water license (4/29/14/*S/0073). There are 32 No. groundwater abstractions, 15 No. surface water abstractions and 1 tidal water abstractions within 2km of the DCO Site Boundary. Additionally, North East Lincolnshire Council has provided information on an additional 19 No. private water abstractions within 2km of the DCO Site Boundary. East Lindsey District Council also provided the details of private water abstractions within their district, with 52 No. private water abstractions within 2km of the DCO Site Boundary. West Lindsey District Council provided the details for one private water supply within 2km of the Proposed Development, located in Keelby and not considered further in the assessment due to the distance from the Proposed Development. Further details can be seen in *ES Volume IV: Appendix 11.1 (Application Document 6.4.11.1)*. No abstractions fall within the DCO Site Boundary.

Discharges

11.5.63 The EA has provided a list of all licensed discharges (accessed June 2022) for the study area. There were no licensed discharges within 2km of the DCO Site Boundary, however there is one that lies downstream of the Laceby Beck / River Freshney Catchment (to N Sea) waterbody. The discharge has a rate of 732m^3/day (dry weather flow) and is located at TA 22090 07150.

Pollution Incidents

11.5.64 Data from the Environment Agency for the Proposed Development indicates that there have been 25 pollution incidents of Category 3 (Minor) within 2 km of the DCO Site Boundary and one of Category 2 (Significant) between 2018 and 2022. The details of these incidents can be found in *ES Volume IV: Appendix 11.1 (Application Document 6.4.11.1)* Within the 500m buffer, there are only 2 incidents (incidents 1666629 and 1991013) both of which are of Category 3 (**Table 11-15**).

Table 11-15: Pollution Incidents in the Study Area between 2018 and 2022

Notification Identifier	Notification Date	Water – Incident Category	National Grid Reference	Incident Status	Category of pollutant	Catchment
1666629	29/11/2018	Category 3 (Minor)	TA 16306 13941	Closed	Oils and Fuel	North Beck Drain
1991013	09/09/2021	Category 3 (Minor)	TF 48003 87793	Closed	Pollutant Not Identified	Trusthorpe Pump Drain

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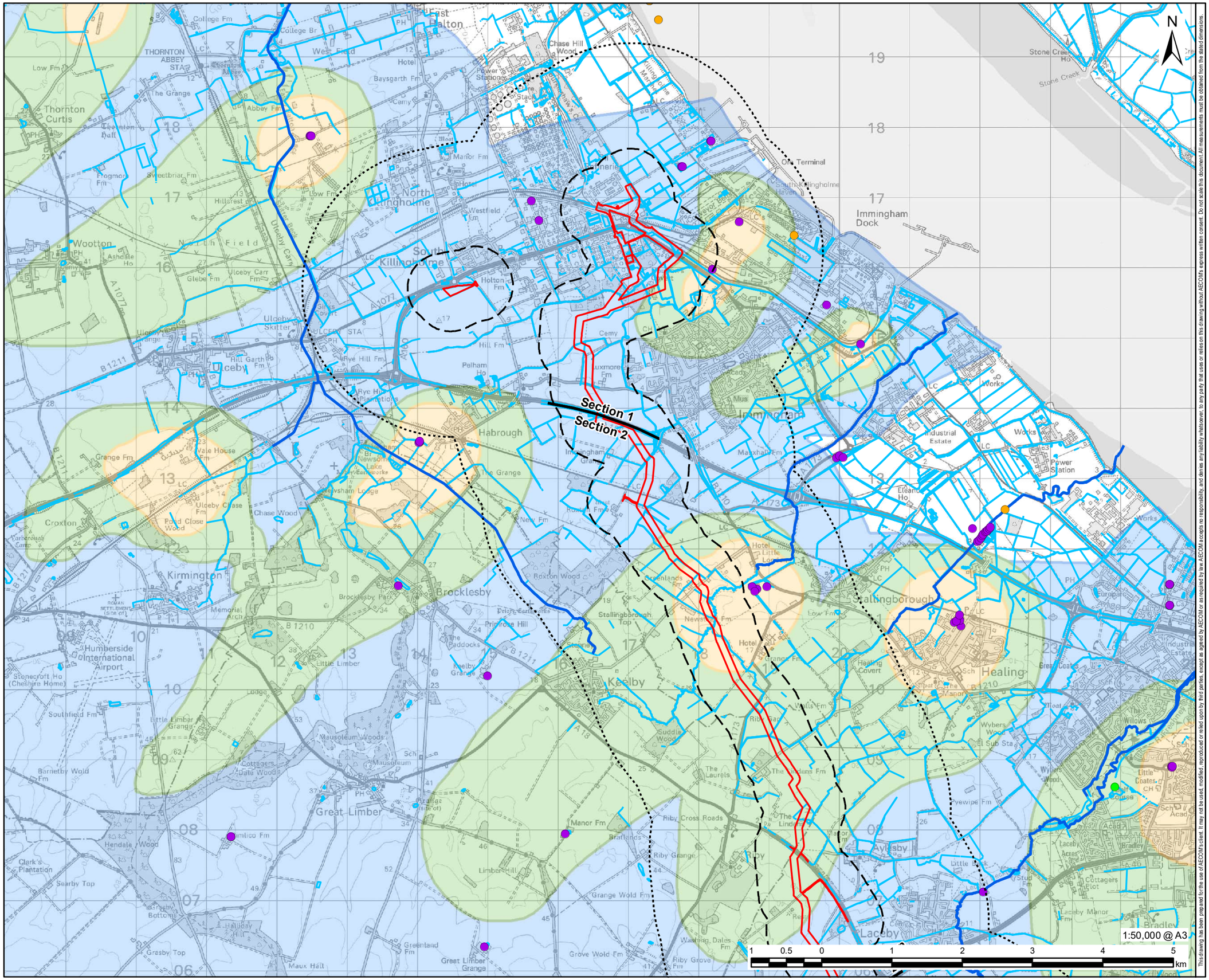

VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break
- EA Main River
- Ordinary Watercourse

Licenced Water Abstraction (EA)

- Ground Water
- Surface Water
- Transitional Water

Source Protection Zone (EA)

- Zone 1 - Inner Protection Zone
- Zone 2 - Outer Protection Zone
- Zone 3 - Total Catchment

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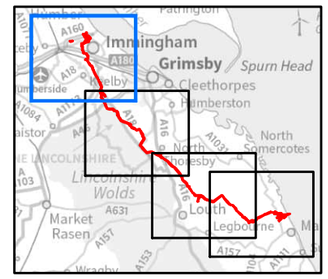

FIGURE TITLE

Figure 11-4 (1 of 4)
Water Resources in the Study Area

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-4

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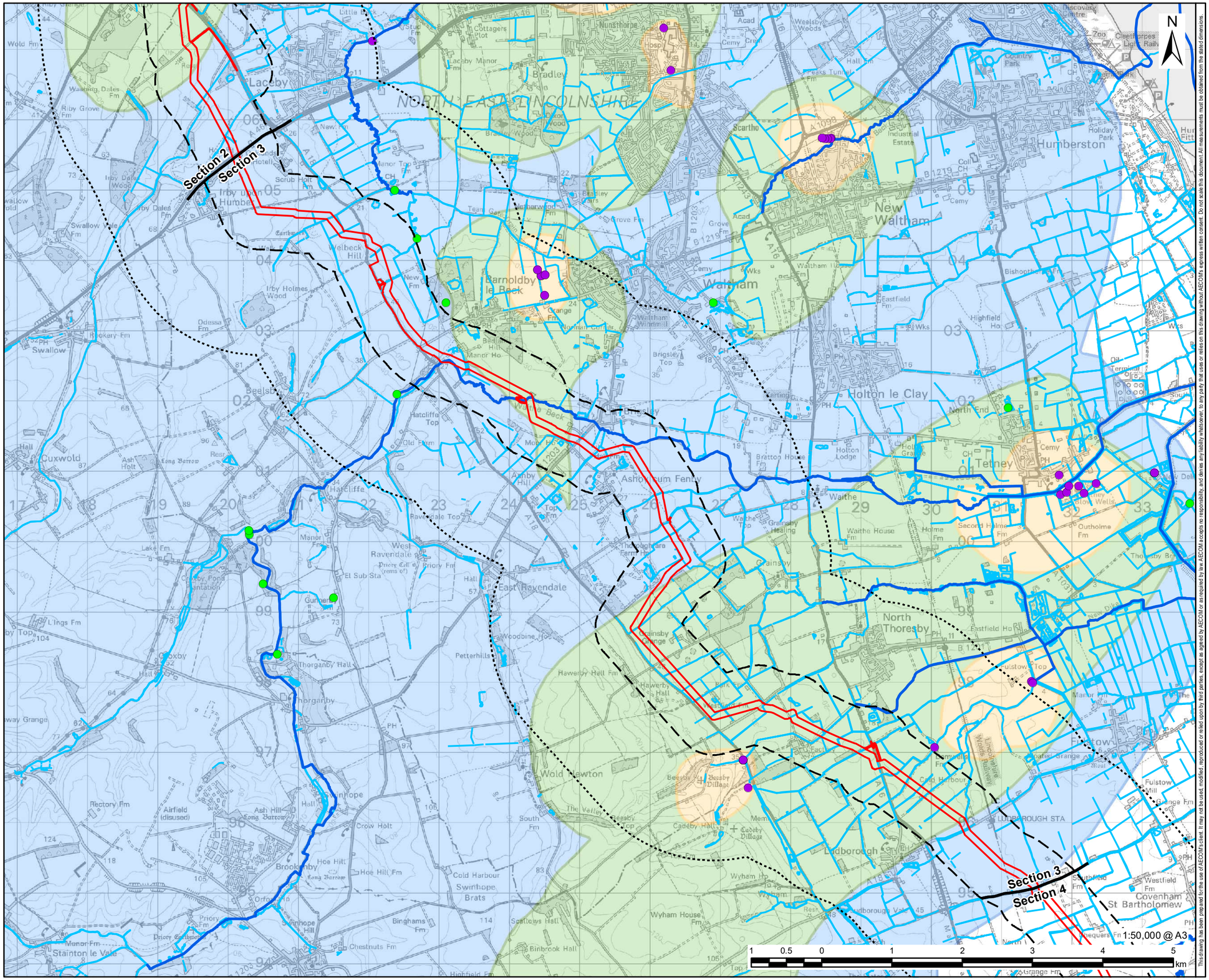

VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break
- EA Main River
- Ordinary Watercourse

Licenced Water Abstraction (EA)

- Ground Water
- Surface Water

Source Protection Zone (EA)

- Zone 1 - Inner Protection Zone
- Zone 2 - Outer Protection Zone
- Zone 3 - Total Catchment

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FIGURE TITLE

Figure 11-4 (2 of 4)
Water Resources in the Study Area

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-4

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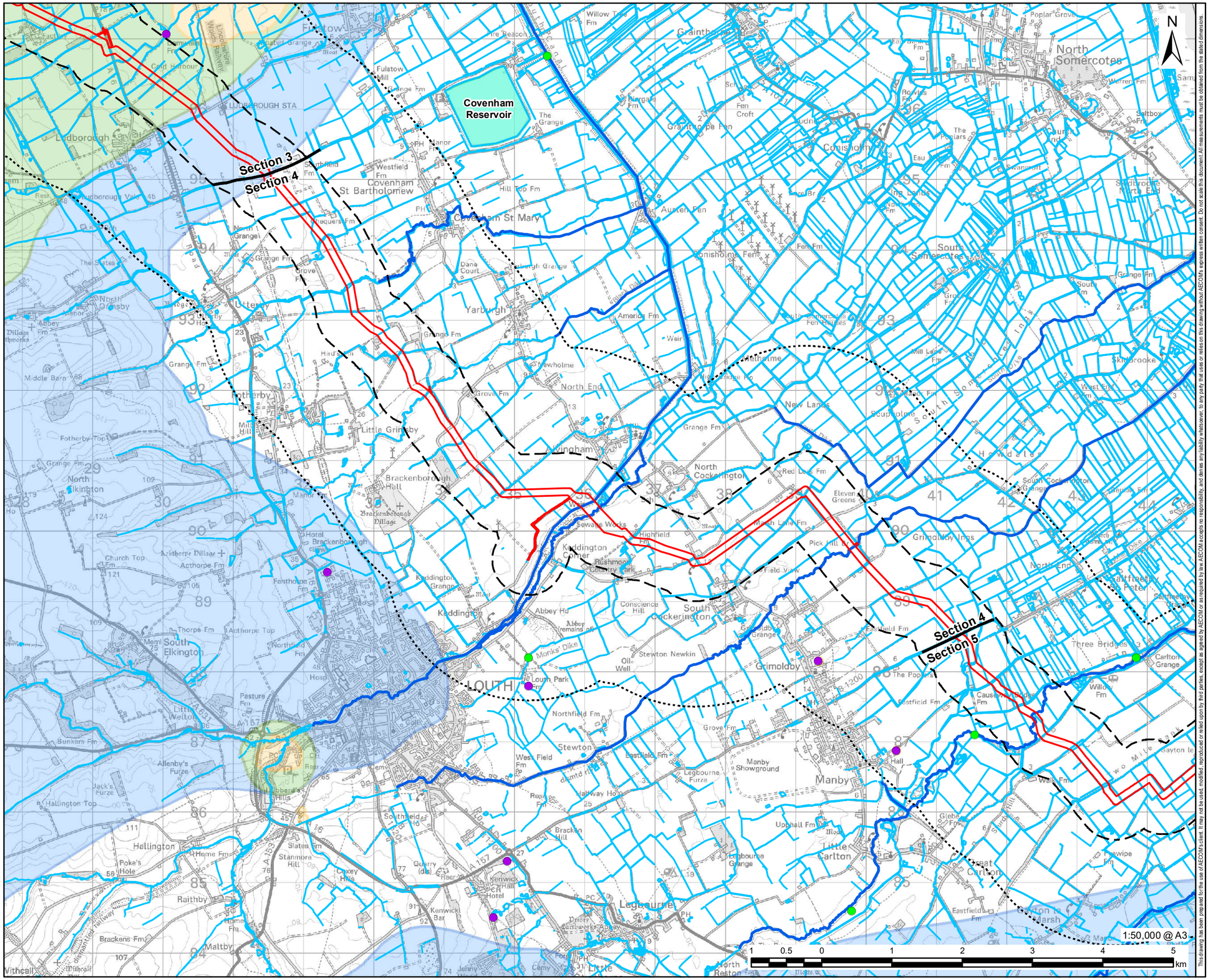

VikingCCS

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PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break
- EA Main River
- Ordinary Watercourse
- Covenham Reservoir

Licenced Water Abstraction (EA)

- Ground Water
- Surface Water

Source Protection Zone (EA)

- Zone 1 - Inner Protection Zone
- Zone 2 - Outer Protection Zone
- Zone 3 - Total Catchment

NOTES:

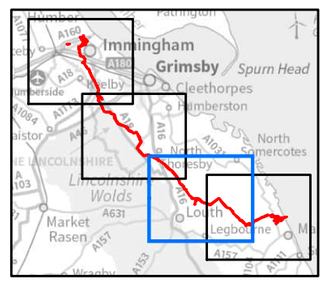

FIGURE TITLE

Figure 11-4 (3 of 4)
Water Resources in the Study Area

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-4

Revision: 4 Drawn: LC Checked: KSB Approved: MW Date: 2023-09-14

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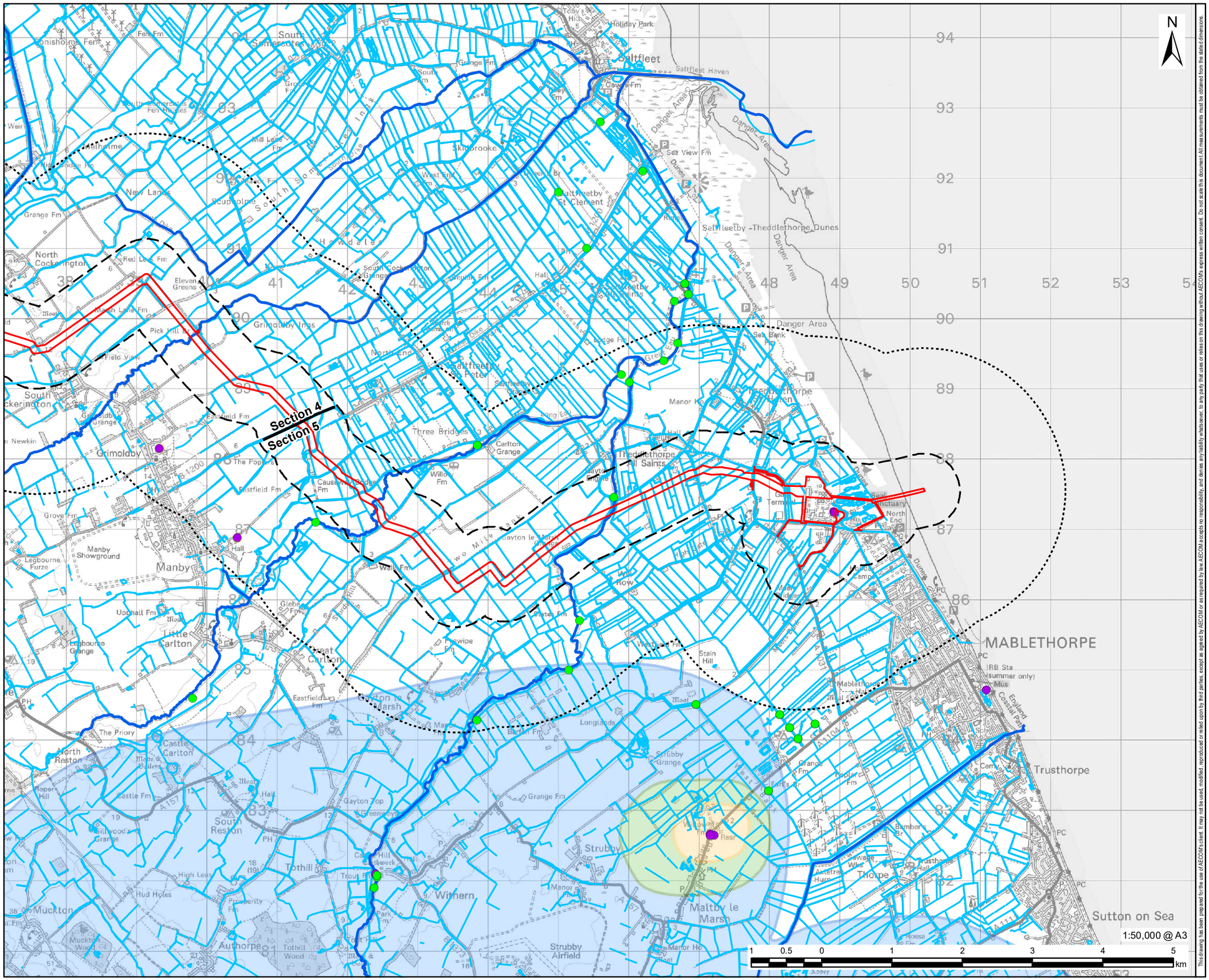

VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break
- EA Main River
- Ordinary Watercourse

Licenced Water Abstraction (EA)

- Ground Water
- Surface Water

Source Protection Zone (EA)

- Zone 1 - Inner Protection Zone
- Zone 2 - Outer Protection Zone
- Zone 3 - Total Catchment

NOTES:
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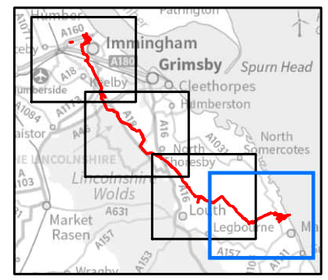

FIGURE TITLE

Figure 11-4 (4 of 4)
Water Resources in the Study Area

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-4

Flood Risk

11.5.65 The Environment Agency carries out maintenance, improvement, or construction work on Main Rivers to manage flood risk. Information on flood risk for this chapter has been obtained from the Environment Agency Flood Maps for Planning (FMfP) and initial consultation with the Environment Agency. Flood risk from all sources for the Proposed Development have been summarised in the FRA (ES *Volume IV: Appendix 11.5 (Application Document 6.4.11.5))* and has been subsequently split by DCO Site Boundary section.

11.5.66 Other rivers are called 'Ordinary Watercourses'. Lead local flood authorities, district councils and internal drainage boards carry out flood risk management work on Ordinary Watercourses. The DCO Site Boundary crosses two IDB: North East Lindsey IDB and Lindsey Marsh Drainage Board. The DCO Site Boundary passes through two district councils, North East Lincolnshire Council and East Lindsey District Council (who will be the LLFAs).

11.5.67 The Environmental Agency classifies areas at risk of fluvial, surface and reservoir flooding through the three magnitude rainfall events:

- **Zone 1, Low Probability**: land assessed as having a less than 1 in 1,000 annual probability of flooding (<0.1% Annual Exceedance Probability (AEP));
- **Zone 2, Medium Probability**: land assessed as having flooding between 1 in 100 (1% AEP) and 1 in 30 (3.3% AEP) annual probability of flooding; and
- **Zone 3, High Probability**: land assessed as having greater than 1 in 30 annual probability of flooding (3.3% AEP).

11.5.68 The Strategic Flood Risk Assessments of North and North East Lincolnshire (Ref 11-45) and East Lindsey Strategic Flood Risk Assessment (Ref 11-46) have been reviewed during this ES to distinguish between Flood Zones 3a and 3b (functional floodplain). There are no Flood Storage Areas within the DCO Site Boundary.

Flood Risk summary

11.5.69 Flooding associated with each section of the Pipeline Corridor is shown in **Table 11-16** to **Table 11-20** and on **Figure 11-5** to **Figure 11-7**.

Table 11-16: Section 1 of Pipeline Corridor within DCO Site Boundary

Flood Risk Source	Comments
Historical Flooding	The EA's Historic Flood Map indicates that Rosper Road, which lies within the DCO Site Boundary, flooded during the January 1953 Tidal Event. The Port of Immingham, to the east, flooded during the 2013 tidal event, however this flood extent does not infringe upon the boundary of the DCO Site Boundary.
Tidal	Section 1 of the DCO Site Boundary are located between 1.5 km and 4 km from the Humber Estuary/North Sea and cross the extent of tidal Flood Zones 2 (0.1-0.5% AEP) and 3 (>1% AEP), as identified by the EA Flood Map for Planning. The EA Asset Management Database (Ref 11-51) indicates that there are tidal flood defences along the River Humber comprising embankments, flood walls and flood gates. Overtopping data from the 2010 Northern Area Tidal Modelling study for the 2006 0.5% and 0.1% AEP scenarios identifies that the DCO Site Boundary would not be affected by the overtopping of defences. The key tidal flood risk in this region is the breach of flood defences, with average breach

Flood Risk Source	Comments
	depths of 1.52 m and 1.81 m for the 0.5% AEP and 0.1% AEP tidal floods at the Immingham facility.
Fluvial	Section 1 of the DCO Site Boundary are considered to be predominantly at risk of tidal flooding. However, the Proposed Development is at risk of fluvial flooding during the construction of the pipeline. Section 1 of the DCO Site Boundary does not cross any Main Rivers, however there are several Ordinary Watercourses, North-East Lindsey IDB maintained watercourses and unnamed land drain crossings
Groundwater	The 1:50,000 BGS Map of Britain (Ref 11-36) indicates that Section 1 of the DCO Site Boundary cross superficial deposits consisting of Tidal Flats (Clay and Silt) and Devensian Till (Diamicton), which are defined as Secondary Undifferentiated aquifers. The superficial deposits are underlain by Burnham Chalk Formation bedrock, which is defined as a principal aquifer. There is therefore the potential for elevated groundwater beneath the site. Borehole records from the BGS indicate a groundwater level of 2.7 m below ground level (bgl) in the vicinity of the Immingham Facility.
Surface Water	Section 1 of the DCO Site Boundary, including the access/laydown areas, are predominantly at very low risk of flooding from surface water. There are isolated areas along the pipeline route at low, medium and high risk. The main pluvial flow routes coincide with watercourses and ditches, in particular South Killingholme Drain. Isolated pockets of pluvial ponding are considered to be reflective of areas of low topography.
Artificial Water Features	Section 1 of the DCO Site Boundary are not considered to be at risk of flooding from artificial sources, including reservoirs.
Climate Change	Climate change effects on tidal flooding have been assessed within the FRA (ES *Volume IV: Appendix 11.5 (Application Document 6.4.11.5)*. With current defences, there is potential for overtopping of defences for the 2115 0.5% AEP and 0.1% AEP climate change scenarios, however the Shoreline Management Plan policy is 'Hold the Line', therefor embankments may be raised and improved to counter sea level rise as required. However, with the 2115 0.5% AEP and 0.1% AEP climate change scenario, the tie-in point south of the Phillips 66 Humber Refinery (P66) could be a residual risk of flooding due to breach of the defences. The breach modelling results indicate that the Immingham facility could be inundated up to 3.03 m and 3.25 m during the 2115 0.5% and 0.1% AEP breach scenarios respectively.

Table 11-17: Section 2 of Pipeline Corridor within DCO Site Boundary

Flood Risk Source	Comments
Historical Flooding	The EA's Historic Flood Map (Ref 11-52) indicates that Section 2 of the DCO Site Boundary do not lie within a historic flood extent.
Tidal	Section 2 of the DCO Site Boundary are not considered to be risk of flooding from tidal sources, however given the proximity to the North Sea, it is likely that some of the watercourses crossed by the pipeline are tidally influenced within the lower reaches.
Fluvial	Section 2 of the DCO Site Boundary cross Main Rivers, IDB maintained watercourses, Ordinary Watercourses and unnamed land drains. The EA Flood Map for Planning (Ref 1 and reproduced in Figure 2) indicates that the Main River crossings lie in Flood Zones 2 (0.1-0.5% AEP) and 3 (>1% AEP).
Groundwater	The 1:50,000 BGS Map of Britain (Ref 11-36) indicates that Section 2 of the DCO Site Boundary cross superficial deposits consisting of Tidal Flats (Clay and Silt) and Devensian Till (Diamicton), which are defined as Secondary Undifferentiated aquifers. The superficial deposits are underlain by Burnham Chalk Formation bedrock, which is defined as a principal aquifer. There is therefore the potential for elevated groundwater beneath the site. Borehole records from the BGS indicate a groundwater level of 2.45 m bgl near Stallingborough, however no other boreholes within Section 2 of the DCO Site Boundary recorded any groundwater.
Surface Water	Section 2 of the DCO Site Boundary are predominantly below ground, except the block valve station, which will be installed off Washingdales Lane. This block valve station would be constructed upon arable land that currently has a low risk of flooding from surface water.
Artificial Water Features	Section 2 of the DCO Site Boundary is at risk of flooding from reservoirs upstream on the Laceby Beck, however the majority of the DCO Site Boundary are not at risk of flooding from artificial sources. Given that the pipeline will be below ground and there is no above ground infrastructure located within this area at risk
Climate Change	Groundwater levels may rise as a result of climate change.

Table 11-18: Section 3 of Pipeline Corridor within DCO Site Boundary

Flood Risk Source	Comments
Historical Flooding	The EA's Historic Flood Map (Ref 11-52) indicates that Section 3 of the DCO Site Boundary does not lie within a historic flood extent. Waithe Beck previously flooded in 2007 at Brigsley.
Tidal	Section 3 of the DCO Site Boundary is not considered to be at risk of flooding from tidal sources, however given the proximity to the North Sea, it is likely that some of the watercourses crossed by the pipeline are tidally influenced in the lower reaches.

Flood Risk Source	Comments
Fluvial	Section 3 of the DCO Site Boundary crosses Main Rivers, IDB maintained watercourses, Ordinary Watercourses and unnamed land drains. The EA Flood Map for Planning (Ref 11-41) indicates that the Main River crossings lie in Flood Zones 2 (0.1-0.5% AEP) and 3 (>1% AEP).
Groundwater	The 1:50,000 BGS Map of Britain (Ref 11-36) indicates that Section 3 of the DCO Site Boundary cross superficial deposits consisting of Tidal Flats (Clay and Silt) and Devensian Till (Diamicton), which are defined as Secondary Undifferentiated aquifers. The superficial deposits are underlain by Burnham Chalk Formation bedrock, which is defined as a principal aquifer. There is therefore the potential for elevated groundwater beneath the site. Borehole records from the BGS indicate that groundwater was not encountered by any of the boreholes within Section 3 of the DCO Site Boundary.
Surface Water	Section 3 of the DCO Site Boundary are predominantly below ground, except the block valve station, which will be installed off Thoroughfare in Ashby cum Fenby. This block valve station would be constructed upon arable land that currently has a high risk of flooding from surface water.
Artificial Water Features	Section 3 of the DCO Site Boundary are not considered to be at risk of flooding from artificial sources, including reservoirs.
Climate Change	Groundwater levels may rise as a result of climate change.

Table 11-19: Section 4 of Pipeline Corridor within DCO Site Boundary

Flood Risk Source	Comments
Historical Flooding	The EA's Historic Flood Map (Ref 11-52) indicates that Section 4 of the DCO Site Boundary does not lie within a historic flood extent. Poulton Drain previously flooded in November 2019 near Covenham St Mary and Yarburgh.
Tidal	Section 4 of the DCO Site Boundary is not considered to be at risk of flooding from tidal sources, however given the proximity to the North Sea, it is likely that some of the watercourses crossed by the pipeline are tidally influenced within the lower reaches.
Fluvial	Section 4 of the DCO Site Boundary crosses Main Rivers, IDB maintained watercourses, Ordinary Watercourses and unnamed land drains. The EA Flood Map for Planning (Ref 11-41) indicates that the Main River crossings lie in Flood Zones 2 (0.1-0.5% AEP) and 3 (>1% AEP).
Groundwater	The 1:50,000 BGS Map of Britain (Ref 11-36) indicates that Section 4 of the DCO Site Boundary cross superficial deposits consisting of Tidal Flats (Clay and Silt) and Devensian Till (Diamicton), which are defined as Secondary Undifferentiated aquifers. The superficial deposits are underlain by Burnham Chalk Formation bedrock, which is defined as a principal aquifer. There is therefore the potential for elevated groundwater beneath the

Flood Risk Source	Comments
	site. Borehole records from the BGS indicate that groundwater was not encountered by any of the boreholes within Section 4 of the DCO Site Boundary.
Surface Water	Section 4 of the DCO Site Boundary is predominantly below ground, except the block valve station, which will be installed off Louth Road. This block valve station would be constructed upon arable land that currently has a low risk of flooding from surface water.
Artificial Water Features	The downstream extents of several of the watercourses crossed by the pipeline lie within the flood extent from Covenham Reservoir, however the flood extent does not infringe on Section 4 of the DCO Site Boundary. Section 4 is not considered to be at risk of flooding from artificial sources, including reservoirs.
Climate Change	Groundwater levels may rise as a result of climate change.

Table 11-20: Section 5 of Pipeline Corridor within DCO Site Boundary

Flood Risk Source	Comments
Historical Flooding	The EA's Historic Flood Map (Ref 11-52) indicates that Section 5 of the DCO Site Boundary does not lie within a historic flood extent. The January 1953 Tidal Event inundated the coastline up to Kent Avenue and flooded the area south of Meers Bank, however this flood extent does not infringe upon the boundary of the DCO Site Boundary.
Tidal	The above ground infrastructure within Section 5 of the DCO Site Boundary lies between 0.7 km and 2 km from the North Sea within the tidal extent of Flood Zone 3 (>1% AEP), as identified by the EA Flood Map for Planning (Ref 11-41). The EA Asset Management Database (Ref 11-51) indicates that there are tidal flood defences along this stretch of coastline, consisting of Dunes which range between 7.15 m and 8.36 m. Section 5 of the DCO Site Boundary lies within an area that benefits from a reduction in risk from these defences. Overtopping data from the 2010 Northern Area Tidal Modelling study for the 2006 0.5% and 0.1% AEP scenarios identifies that the DCO Site Boundary would not be affected by the overtopping of defences. The key tidal flood risk in this region is the breach of flood defences. Breach data from the 2010 Northern Area Tidal Modelling study for the 2006 0.5% AEP and 0.1% AEP scenarios identifies that the section of the DCO Site Boundary from The Cut Drain, including all above ground infrastructure would be affected during a breach of the coastline defences, with average breach depths of up to 1.42 m and 1.54 m for the 0.5% AEP and 0.1% AEP tidal floods.
Fluvial	Section 5 of the DCO Site Boundary is considered to be predominantly at risk of tidal flooding. However, the Proposed

Flood Risk Source	Comments
	Development is at risk of fluvial flooding during the construction of the pipeline. Section 5 of the DCO Site Boundary crosses Main Rivers, Ordinary Watercourses, Lindsey Marsh IDB maintained watercourses and unnamed land drains. Due to their proximity to the sea, these watercourses are likely to be tidally influenced at the crossing points.
Groundwater	The 1:50,000 BGS Map of Britain (Ref 11-36) indicates that Section 5 of the DCO Site Boundary crosses superficial deposits consisting of Tidal Flats (Clay and Silt) and Devensian Till (Diamicton), which are defined as Secondary Undifferentiated aquifers. The superficial deposits are underlain by Burnham Chalk Formation bedrock, which is defined as a principal aquifer. There is therefore the potential for elevated groundwater beneath the site. Borehole records from the BGS indicate that groundwater was not encountered by any of the boreholes within Section 5 of the DCO Site Boundary.
Surface Water	Section 5 of the DCO Site Boundary, including the access/laydown areas, is predominantly at very low risk of flooding from surface water. There are isolated areas along the pipeline route at low, medium and high risk. The main pluvial flow routes coincide with watercourses and ditches. Isolated pockets of pluvial ponding are considered to be reflective of areas of low topography, therefore the risk of flooding from surface water is considered to be low and no further mitigation is required.
Artificial Water Features	Section 5 of the DCO Site Boundary is not considered to be at risk of flooding from artificial sources, including reservoirs.
Climate Change	Climate change effects on tidal flooding have been assessed within the FRA (ES *Volume IV: Appendix 11.5 (Application Document 6.4.11.5)*. With current defences, there is potential for overtopping of defences for the 2115 0.5% AEP and 0.1% AEP climate change scenarios, however the Shoreline Management Plan policy is 'Hold the Line', therefor embankments may be raised and improved to counter sea level rise as required. There is a residual risk of tidal flooding due to breaching of the flood defences. The 2115 0.5% AEP and 0.1% AEP climate change scenario, the entire section of the DCO Site Boundary, including all above ground infrastructure may be affected. The breach modelling results indicate that the Theddlethorpe Facility up to 1.67 m and 2.01 m during the 2115 0.5% and 0.1% AEP breach scenarios respectively for Option 1; and up to 2.17 m and 2.50 m during the 2115 0.5% and 0.1% AEP breach scenarios respectively for Option 2.

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Section 1

Section 2

1:50,000 @ A3

1 0.5 0 1 2 3 4 5 km

VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break

Environment Agency - Risk of Flooding from Surface Water

- High - 3.3% AEP
- Medium - 1% AEP
- Low - 0.1% AEP

NOTES:

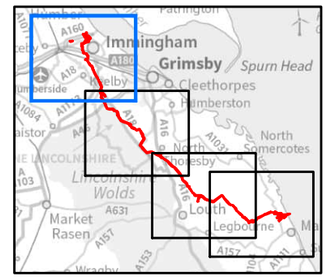

FIGURE TITLE

Figure 11-5 (1 of 4)
Environment Agency Risk of Flooding from Surface Water

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-5

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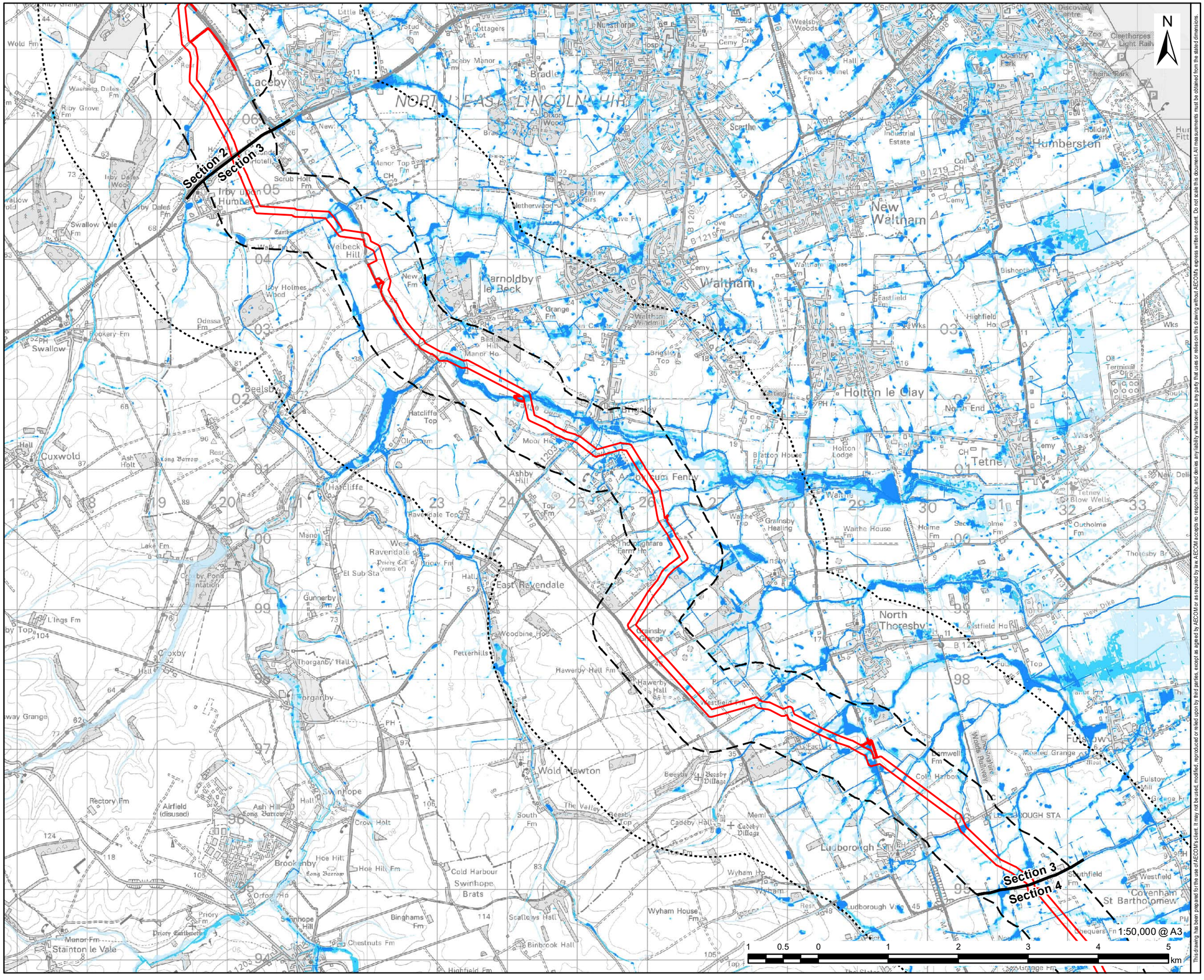

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VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break

Environment Agency - Risk of Flooding from Surface Water

- High - 3.3% AEP
- Medium - 1% AEP
- Low - 0.1% AEP

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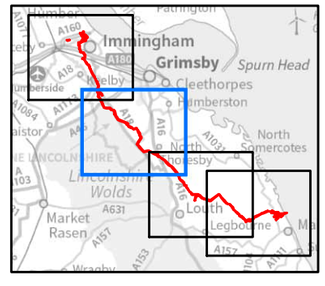

FIGURE TITLE

Figure 11-5 (2 of 4)
Environment Agency Risk of Flooding from Surface Water

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-5

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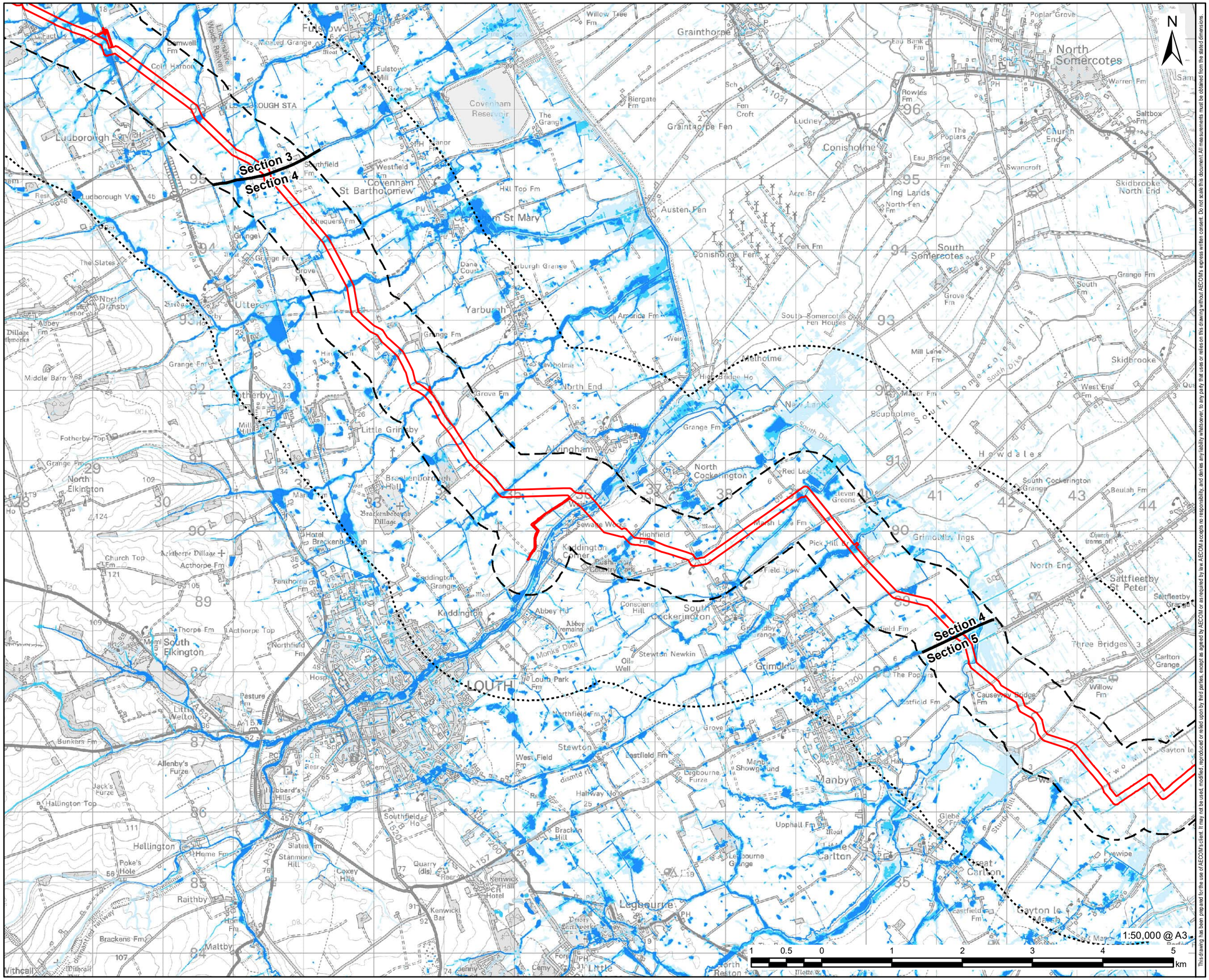

VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break

Environment Agency - Risk of Flooding from Surface Water

- High - 3.3% AEP
- Medium - 1% AEP
- Low - 0.1% AEP

NOTES:

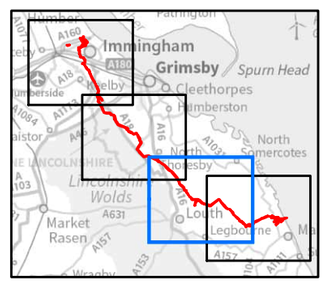

FIGURE TITLE

Figure 11-5 (3 of 4)
Environment Agency Risk of Flooding from Surface Water

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-5

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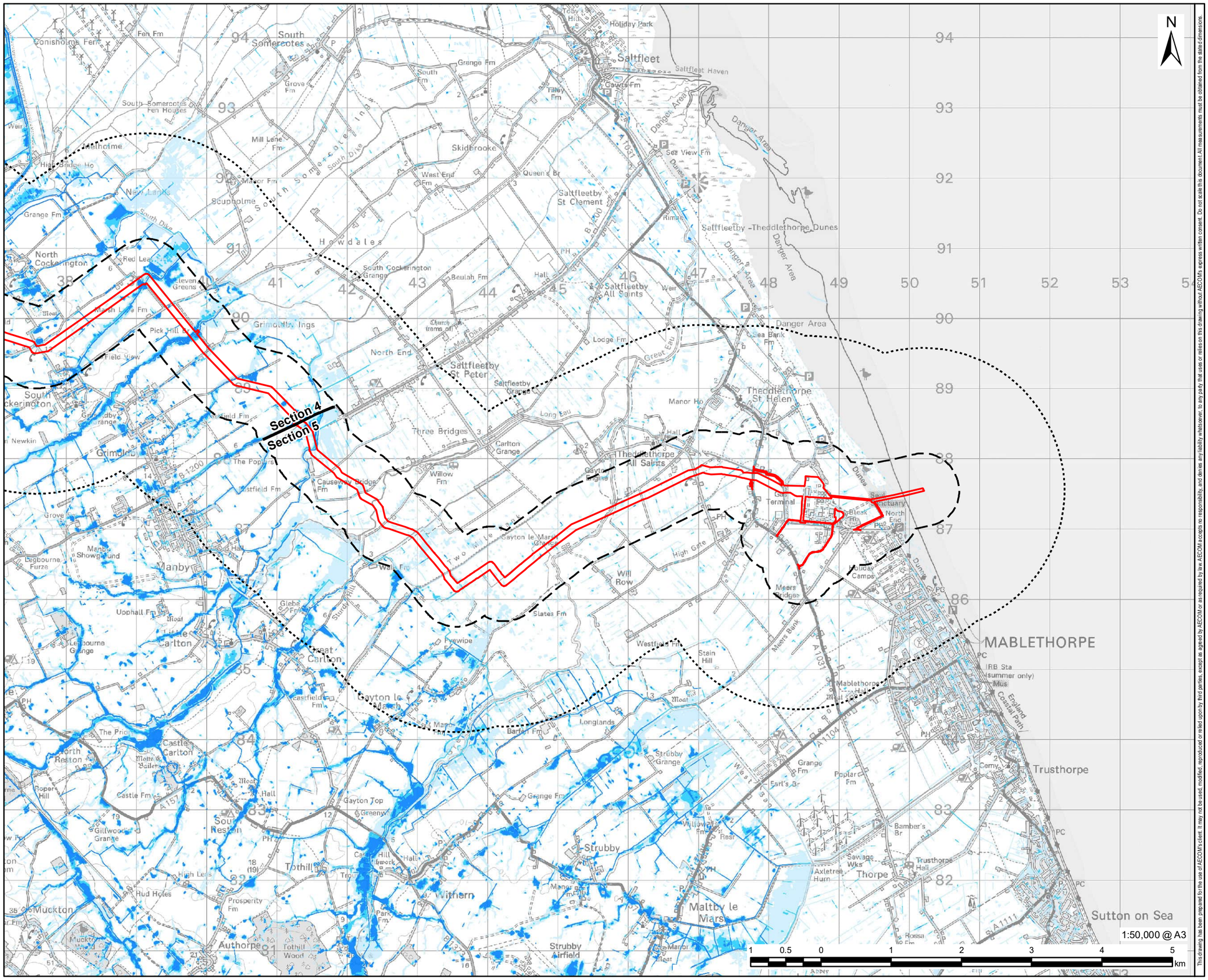

VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break

Environment Agency - Risk of Flooding from Surface Water

- High - 3.3% AEP
- Medium - 1% AEP
- Low - 0.1% AEP

NOTES:

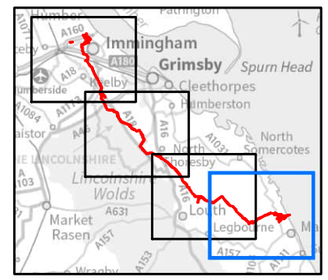

FIGURE TITLE

Figure 11-5 (4 of 4)
Environment Agency Risk of Flooding from Surface Water

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

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Section 1

Section 2

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VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break
- Reservoir Flood Extents

NOTES:

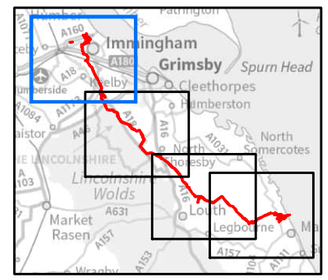

FIGURE TITLE

Figure 11-6 (1 of 4)
Environment Agency Risk of Flooding from Reservoirs

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-6

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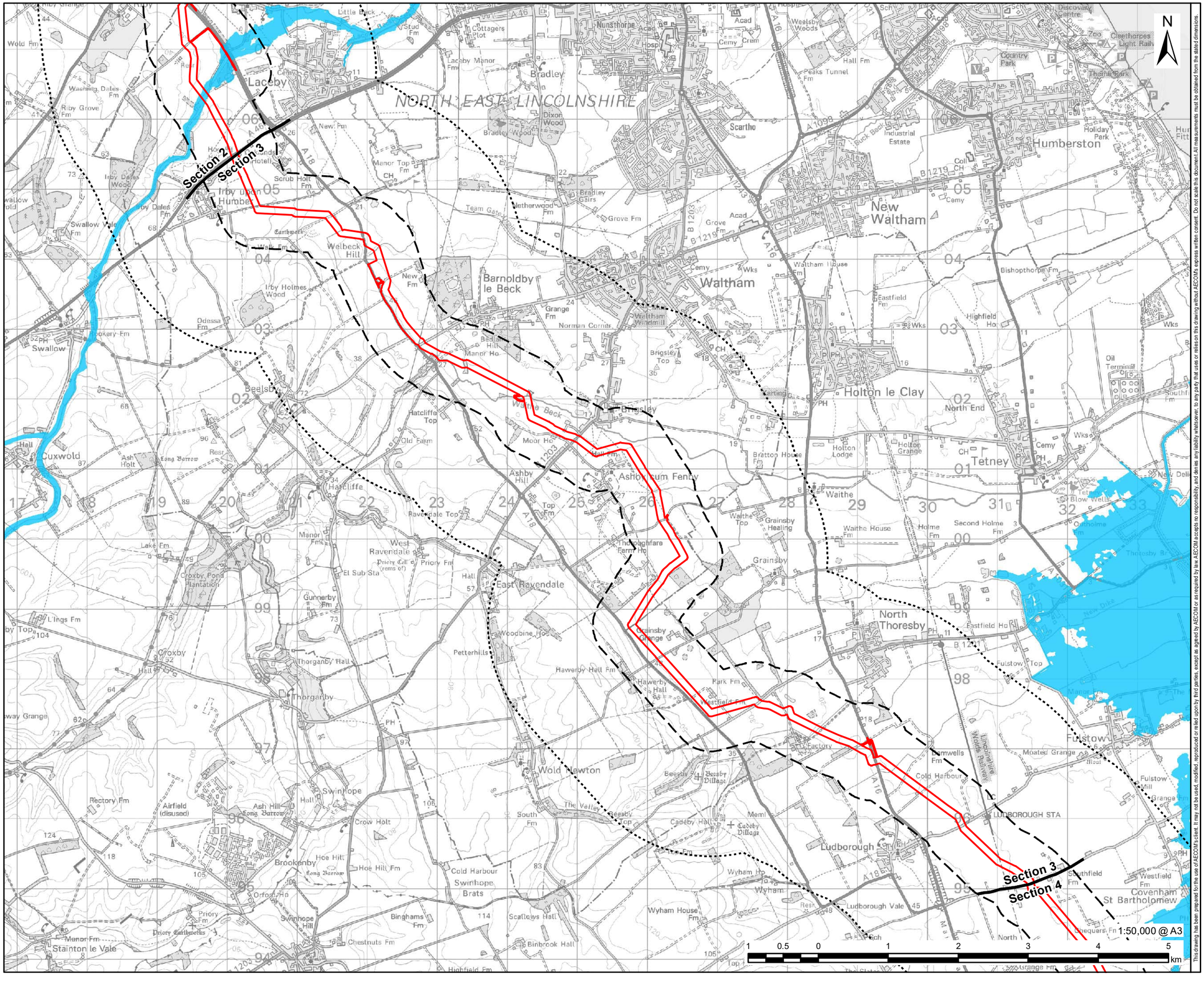

VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break
- Reservoir Flood Extents

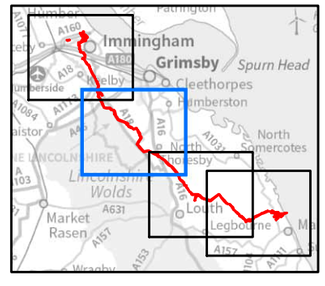

FIGURE TITLE

Figure 11-6 (2 of 4)
Environment Agency Risk of Flooding from Reservoirs

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

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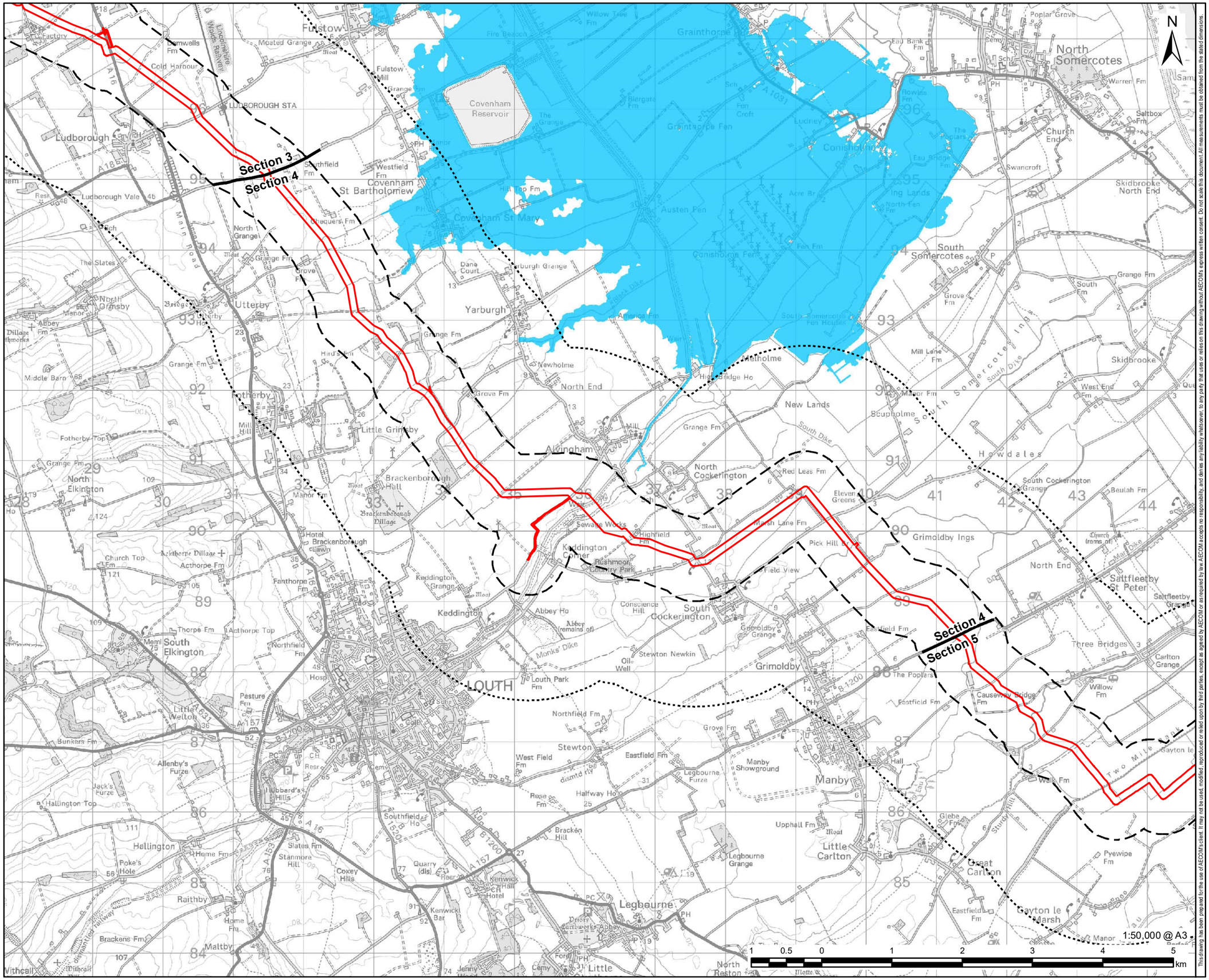

VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break
- Reservoir Flood Extents

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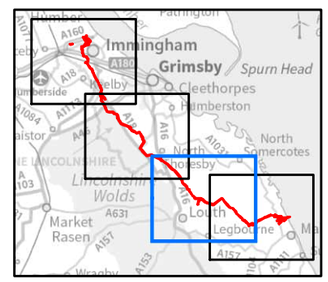


FIGURE TITLE

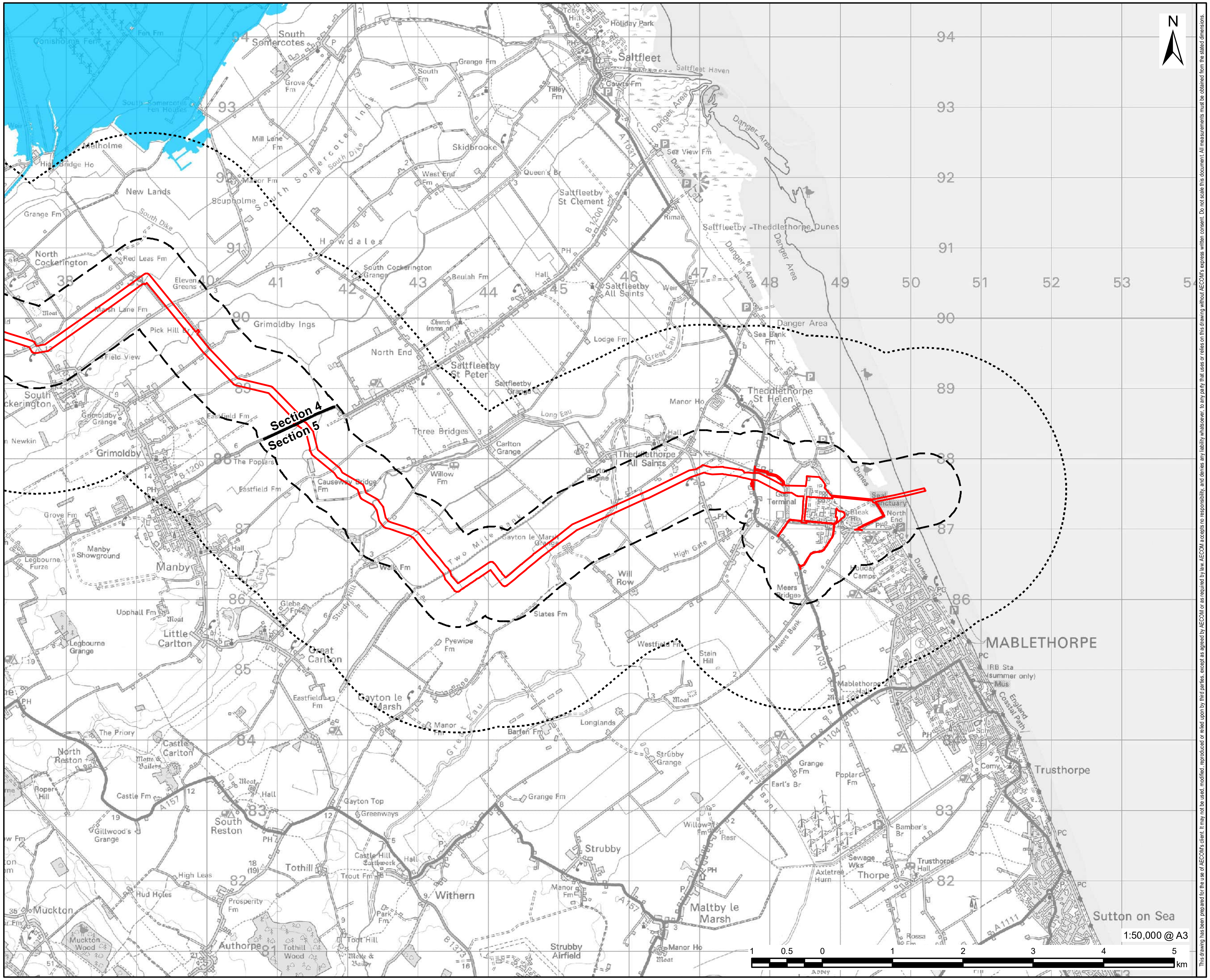
Figure 11-6 (3 of 4)
Environment Agency Risk of Flooding from Reservoirs

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-6



VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break
- Reservoir Flood Extents

NOTES:

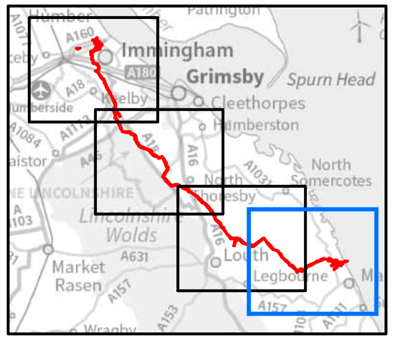


FIGURE TITLE

Figure 11-6 (4 of 4)
Environment Agency Risk of Flooding from Reservoirs

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_230914_ES_11-6

Revision: 3 Drawn: LC Checked: KSB Approved: MW Date: 2023-09-14

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Revision: 4 Drawn: LC Checked: KSB Approved: MW Date: 2023-10-04

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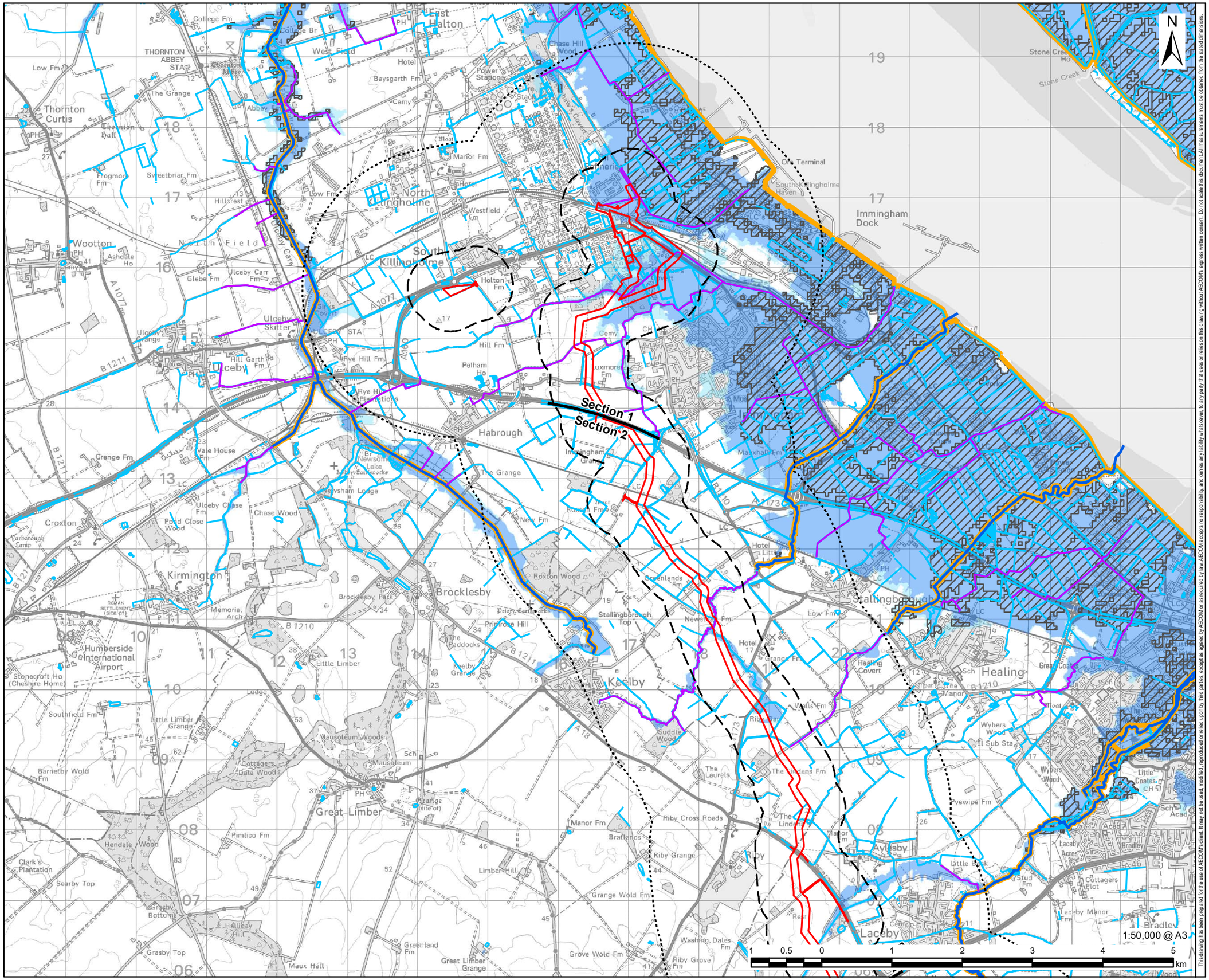

VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break
- Ordinary Watercourse
- IDB Maintained Watercourse
- EA Main River
- Flood Defence
- Reduction in Risk of Flooding from Rivers and Sea due to Defences
- Flood Zone 2
- Flood Zone 3

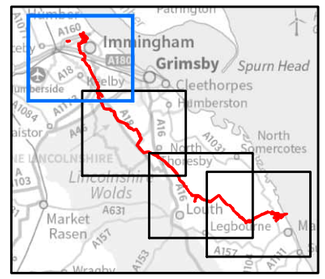

FIGURE TITLE

Figure 11-7 (1 of 4)
Environment Agency Fluvial and Tidal Flood Risk

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_231004_ES_11-7

Revision: 4 Drawn: LC Checked: KSB Approved: MW Date: 2023-10-04

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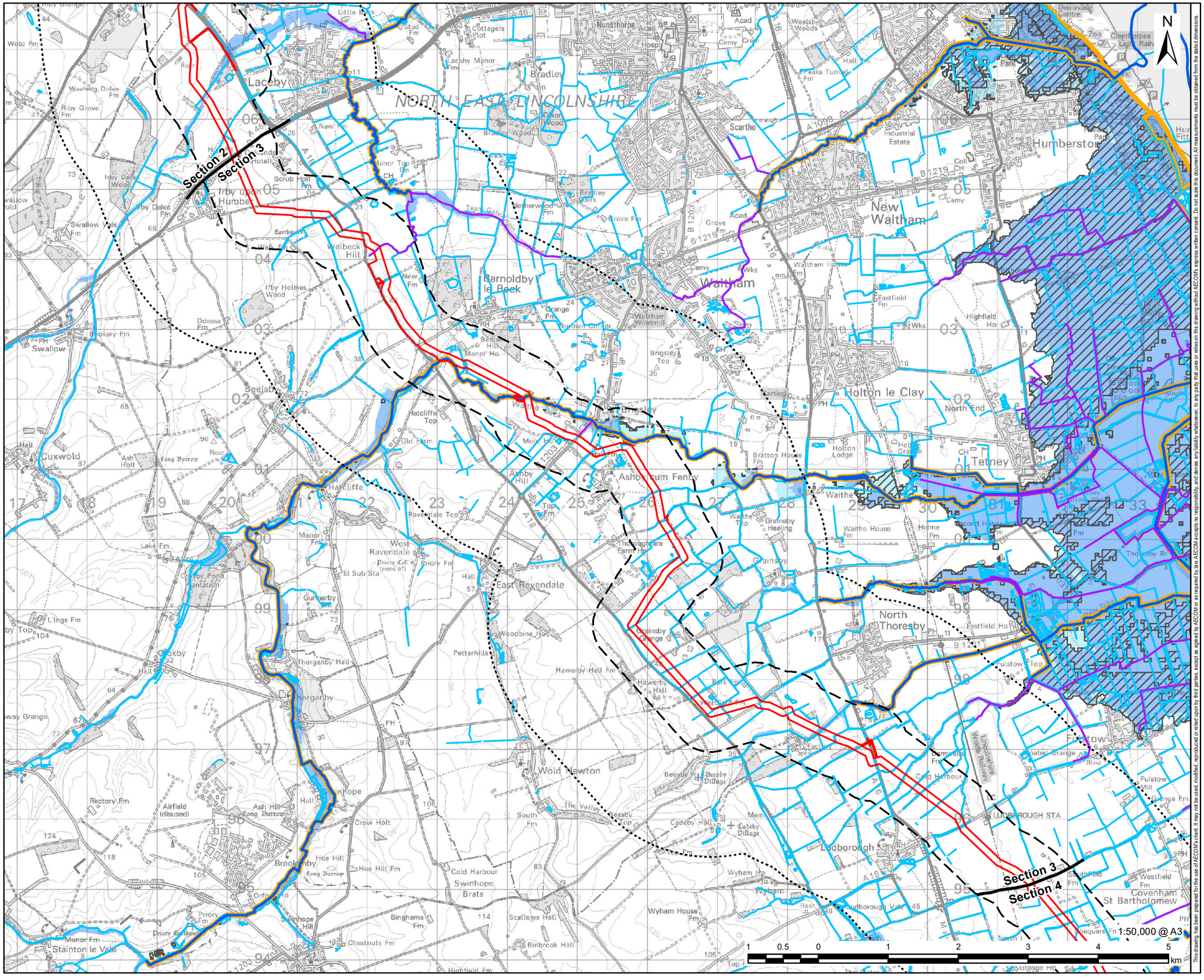

VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break
- Ordinary Watercourse
- IDB Maintained Watercourse
- EA Main River
- Flood Defence
- Reduction in Risk of Flooding from Rivers and Sea due to Defences
- Flood Zone 2
- Flood Zone 3

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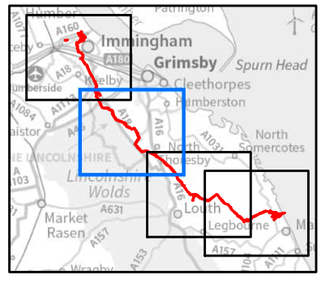

FIGURE TITLE

Figure 11-7 (2 of 4)
Environment Agency Fluvial and Tidal Flood Risk

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_231004_ES_11-7

Revision: 4 Drawn: LC Checked: KSB Approved: MW Date: 2023-10-04

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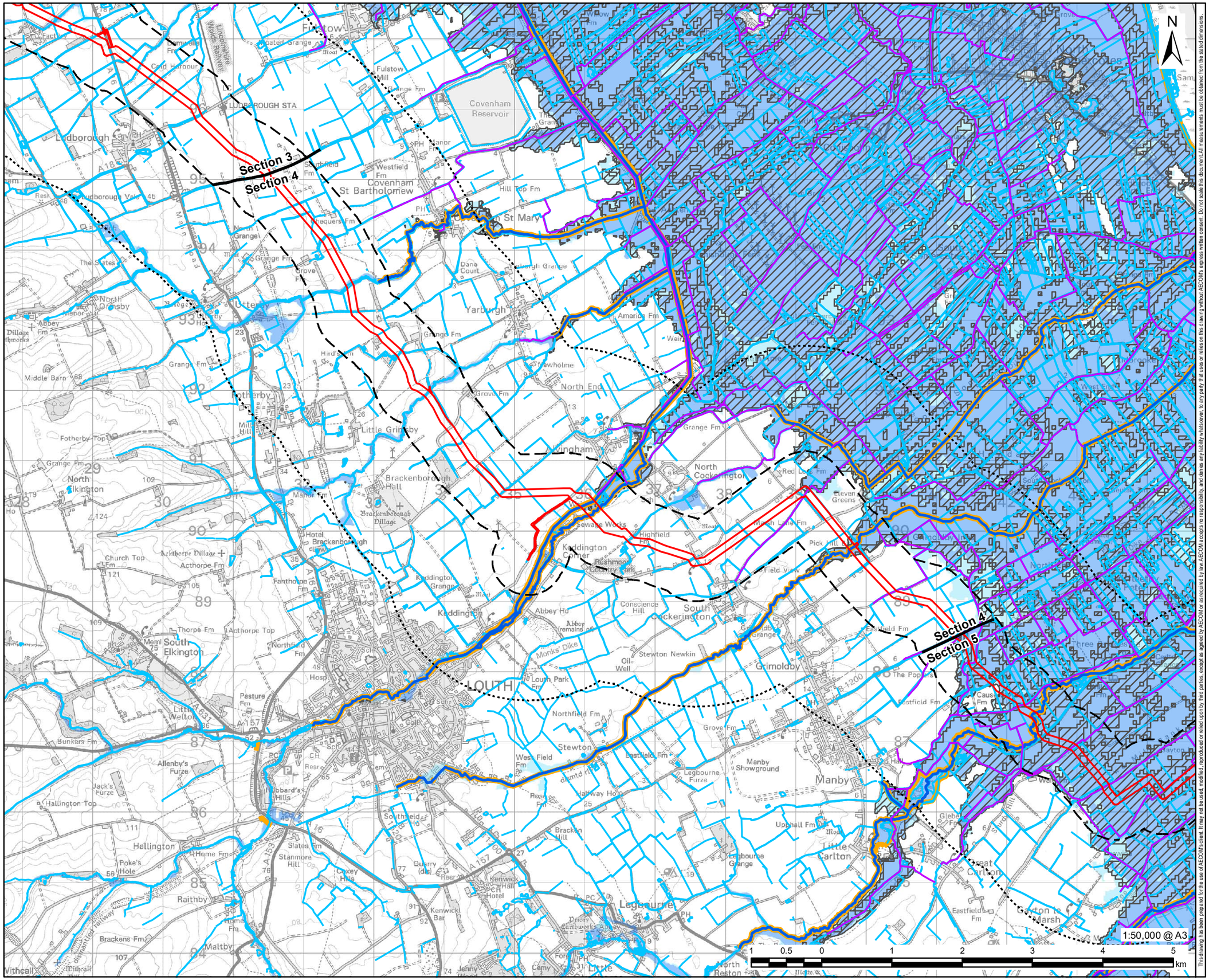

VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break
- Ordinary Watercourse
- IDB Maintained Watercourse
- EA Main River
- Flood Defence
- Reduction in Risk of Flooding from Rivers and Sea due to Defences
- Flood Zone 2
- Flood Zone 3

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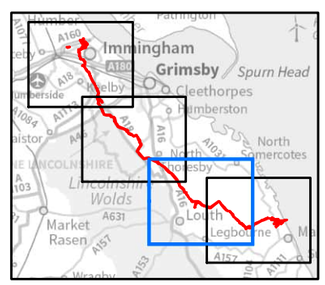


FIGURE TITLE

Figure 11-7 (3 of 4)
Environment Agency Fluvial and Tidal Flood Risk

ISSUE PURPOSE

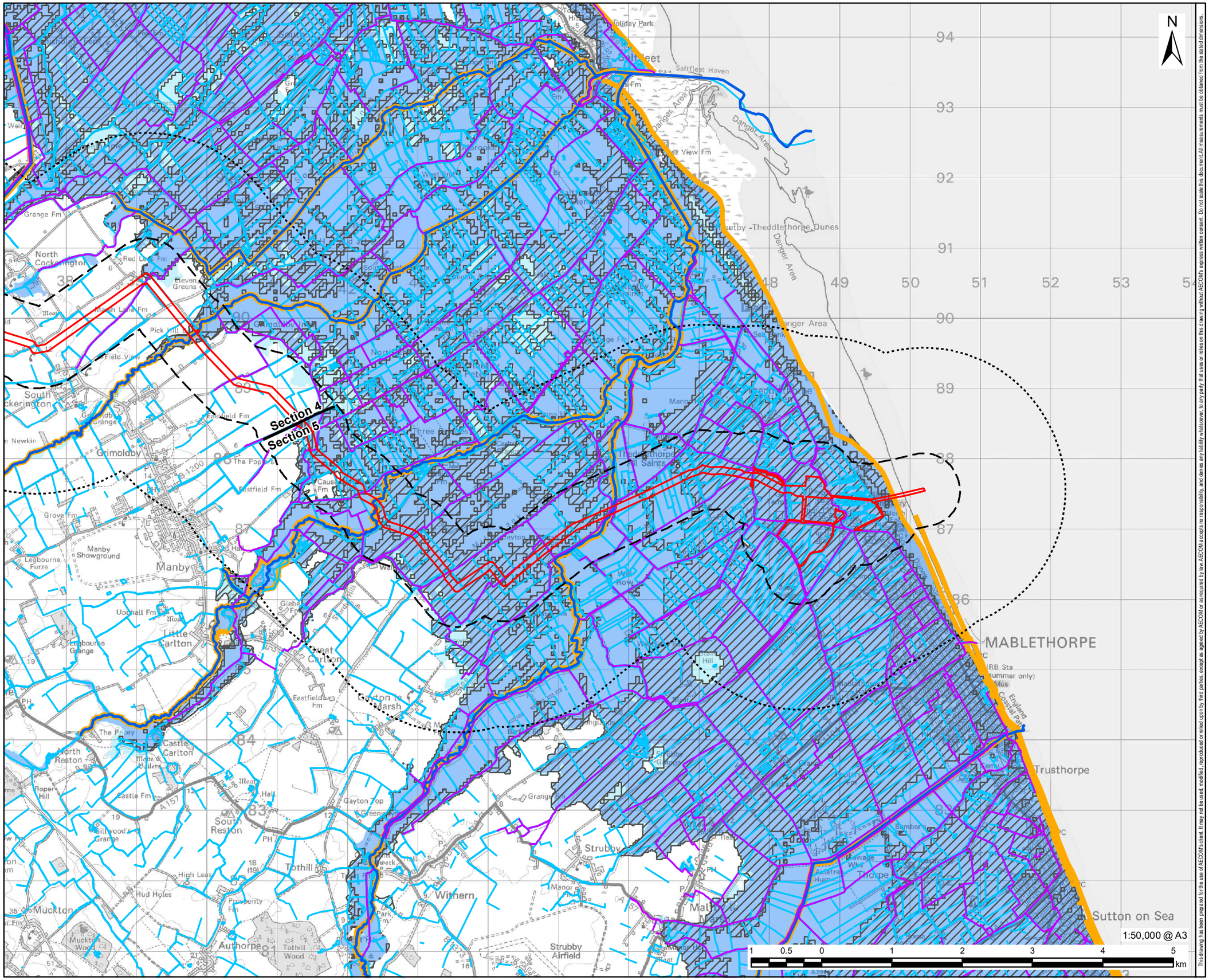
ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_231004_ES_11-7

Revision: 4 Drawn: LC Checked: KSB Approved: MW Date: 2023-10-04

Filename: \\eu.aecomnet.com\EMIA\UK\UKNCL2\Jobs\60668955 V_Net_Zero_Project\900_CAD_GIS\920_GIS\02_Maps\ES\VCCS_ES_11-7_Fluvial_and_Tidal_Flood_Risk_v4_20231004_LC.mxd



VikingCCS

AECOM

PROJECT

Viking CCS Pipeline

LEGEND

- DCO Site Boundary
- 500m Study Area
- 2km Study Area
- Route Section Break
- Ordinary Watercourse
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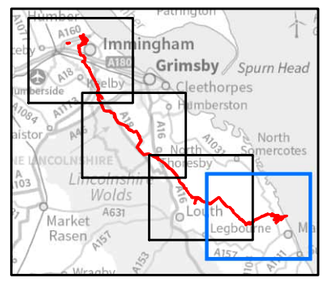

FIGURE TITLE

Figure 11-7 (4 of 4)
Environment Agency Fluvial and Tidal Flood Risk

ISSUE PURPOSE

ENVIRONMENTAL STATEMENT

PROJECT NUMBER / REFERENCE

60668955 / VCCS_231004_ES_11-7

Receptor Values

11.5.70 The importance values for the receptors within the study area of the Proposed Development described below are listed in **Table 11-21** below.

11.5.71 The groundwater receptors, including aquifers and artesian water features are covered within *Chapter 9: Geology and Hydrogeology* of this ES. Potential impacts to ponds and other minor standing water features are covered within *Chapter 6: Ecology and Biodiversity*.

Table 11-21: Receptor Importance Values

Section	Water feature	Importance		
		Surface Water	Hydromorphology	Flood Risk
Section 1 – 4	Humber Estuary	Very High Importance on the basis of being a WFD designated waterbody; being designated as a SSSI and SAC immediately downstream of the DCO Site Boundary and within the study area.	Low Importance due to the significant modifications of the channel and the flow and tidal conditions.	Not applicable
Section 4 and 5	Lincolnshire Water body (coastal WFD)	High Importance on the basis of being a WFD designated coastal waterbody	Low Importance due to the significant modifications of the channel and the flow and tidal conditions.	Not applicable
Section 1	Skitter Beck / East Halton Beck Waterbody (GB104029067655)	Very high Importance on the basis of being a chalk stream, which is protected under UK habitat legislation.	Medium Importance on the basis of being a chalk stream but is artificial in character and heavily modified.	Medium importance as located within an area with industrial / less vulnerable development
	Internal Drainage Board watercourses (including Harborough Marsh Drain)	As water features which have the potential to support species such as water vole and otters, these are considered to be of Medium Importance surface water.	Low importance, artificial or heavily modified water features with artificial cross-sections.	
	Other permanent watercourses	Medium Importance receptor for water quality on the basis of not having a WFD classification but is estimated to have a Q95 flow >0.001 m^3/s.	Low importance as generally artificial surface water features or have been heavily impacted by surrounding land uses (i.e., agriculture, industrial or urban use)	

Section	Water feature	Importance		
		Surface Water	Hydromorphology	Flood Risk
Section 2	North Beck Drain (GB104029067575)	Very high Importance on the basis of being a chalk stream, which is protected under UK habitat legislation.	Very High Importance on the basis of being a chalk stream and showing evidence of previous modification and realignment, however, shows some natural features.	Medium importance as located within an area with agricultural / less vulnerable development
	Mawnbridge Drain(GB104029067540)	High Importance on the basis of being a WFD designated watercourse but with a Q95 flow of <1.0 m^3/s.	Low Importance receptor for morphology on the basis of being largely artificial in character as a straightened channel.	
	Internal Drainage Board watercourses (including Old Fleet Drain)	As water features which have the potential to support species such as water vole and otters, these are considered to be of Medium Importance surface water.	Low importance, artificial or heavily modified surface water features with artificial cross-sections.	
	Other permanent watercourses	Medium Importance receptor for water quality on the basis of not having a WFD classification but is estimated to have a Q95 >0.001 m^3/s.	Low importance as generally artificial surface water features or have been heavily impacted by surrounding land uses (i.e. agriculture, industrial or urban use)	
Section 3	Laceby Beck / River Freshney (to N Sea) (GB104029067530)	Very high Importance on the basis of being a chalk stream, which is protected under UK habitat legislation.	High Importance on the basis of being a chalk stream and showing signs of previous alteration with minor flow levels.	Medium importance as located within an area with agricultural / less vulnerable development
	Waithe Beck lower (to Tetney Lock) (GB104029062100)	Very high Importance on the basis of being a chalk stream, which is protected under UK habitat legislation.	Very High Importance on the basis of being a chalk stream and showing evidence of previous modification and realignment, however, shows some natural features.	

Section	Water feature	Importance		
		Surface Water	Hydromorphology	Flood Risk
	Land Dike Drain to Louth Canal (West) (GB104029062162)	High Importance on the basis of being a WFD designated watercourse but with a Q95 flow of <1.0 m^3/s.	Medium importance on the basis of its Hydromorphological Elements supporting Good Status.	
	Other permanent watercourses	Medium Importance receptor for water quality on the basis of not having a WFD classification but is estimated to have a Q95 >0.001 m^3/s.	Low importance as generally artificial surface water features or have been heavily impacted by surrounding land uses (i.e. agriculture, industrial or urban use)	
Section 4	Covenham Reservoir Water Body (GB30432209)	Very High Importance on the basis of being a WFD designated waterbody and having a critical social or economic uses (e.g., public water)	Low Importance for morphology as an artificial waterbody – however over 1 km from DCO Site Boundary therefore scoped out of the assessment.	Low importance as a water compatible feature.
	Poulton Drain (trib of Louth Canal) (GB104029062010)	High Importance on the basis of being a WFD designated watercourse but with a Q95 flow of <1.0 m^3/s	Medium Importance on the basis of showing evidence of substantial modification and realignment, but still retaining some natural features	Medium importance as located within an area with agricultural / less vulnerable development
	Black Dyke (trib of Louth Canal) (GB104029062000)	High Importance on the basis of being a WFD designated watercourse and a Q95 flow of <1.0 m^3/s	Low Importance on the basis of showing evidence of substantial modification and realignment, being artificially straight with steep, incised banks in places.	
	Louth Canal (GB104029061990)	High Importance on the basis of being a WFD designated watercourse and with a Q95 flow of <1.0 m^3/s.	Low importance due to being an artificial, straight, channelised watercourse with artificial banks.	

Section	Water feature	Importance		
		Surface Water	Hydromorphology	Flood Risk
	South Dike and Grayfleet Drain (GB105029061680)	High Importance on the basis of being a WFD designated watercourse but with a Q95 flow of <1.0 m^3/s	Low Importance on the basis of showing evidence of substantial modification and realignment, being artificially straight with steep, incised banks in places.	
	Internal Drainage Board watercourses	As water features which have the potential to support species such as water vole and otters, these are considered to be of Medium Importance surface water.	Low importance, artificial or heavily modified surface water features with artificial cross-sections.	
	Other permanent watercourses	Medium Importance receptor for water quality on the basis of not having a WFD classification but is estimated to have a Q95 >0.001 m^3/s.	Low importance as generally artificial surface water features or have been heavily impacted by surrounding land uses (i.e. agriculture, industrial or urban use)	
Section 5	Long Eau (GB105029061670)	High Importance on the basis of being a WFD designated watercourse and with a Q95 flow of <1.0 m^3/s	Low Importance on the basis of showing evidence of substantial modification and realignment, being artificially straight with steep, incised banks in places.	Medium importance as located within an area with agricultural / less vulnerable development.
	Great Eau (d/s of South Thoresby) (GB105029061660)	High Importance on the basis of being a WFD designated watercourse and with a Q95 flow of <1.0 m^3/s	Medium Importance on the basis of showing signs of previous alteration but still retaining some natural features.	
	Internal Drainage Board watercourses: Mills and Harps Drain & Rotten Row Drain	As water features which support species such as water vole and otters, High Importance water	Low importance, artificial or heavily modified surface water features with	

Section	Water feature	Importance		
		Surface Water	Hydromorphology	Flood Risk
		features for surface water. Watercourses for surface water.	artificial cross-sections.	
	Internal Drainage Board watercourses	As water features which have the potential to support species such as water vole and otters, these are considered to be of Medium Importance surface water.	Low importance, artificial or heavily modified surface water features with artificial cross-sections.	
	Other permanent watercourses	Medium Importance receptor for water quality on the basis of not having a WFD classification but is estimated to have a Q95 >0.001 m^3/s.	Low importance as generally artificial watercourses or have been heavily impacted by surrounding land uses (i.e. agriculture, industrial or urban use)	
	Saltfleetby – Theddlethorpe Dunes (SSSI, SAC, NNR)	Very High Importance on the basis of being designated as a SSSI and SAC, however dependent upon coastal processes.	Very High Importance on the basis of being near to or pristine conditions, with well-developed and diverse geomorphic forms and processes.	Very High Importance on the basis of being a regional flood defence.
All	Ephemeral and/or artificial drains, ditches	Low Importance water features as industrial, artificial and ephemeral watercourses lacking any protected species (as far as currently known)	Low importance due to likely comprising ephemeral watercourses.	Low importance due to small catchment area and ephemeral nature
	Other Internal Drainage watercourses	As industrial, artificial watercourses lacking any protected species (as far as is currently known) or designations, these are considered Low Importance watercourses for water quality.	Low importance, artificial or heavily modified watercourses with artificial cross-sections (may change following detailed site visits)	Medium importance as located within agricultural or industrial areas / less vulnerable development

Future Baseline

Construction

11.5.72 As outlined in *Chapter 3: Description of the Proposed Development,* of this ES the peak of construction is expected to be in 2026 and complete in 2027.

11.5.73 The future baseline has been determined qualitatively by considering the possibility of changes in the attributes that are considered when deciding the importance of water bodies in the study area.

11.5.74 Generally, there is an improving trend in water quality and the environmental health of waterways in the UK since the commencement of significant investment in sewage treatment in the 1990s, the adoption of the WFD from 2003, the implementation of the Environment Act 2021, and the application of ever more stringent planning policies. In terms of water quality impacts, the future baseline assumes that all WFD water bodies achieve their planned target status by 2027. However, each water body lists these as unachievable due to disproportionate burdens – unfavourable balance of costs and benefits or unrealistic timeframe for ecological recovery.

11.5.75 It is likely that through the action of new legislative requirements and ever more stringent planning policy and regulation, that the health of the water environment will continue to improve post-2027, although there are significant challenges such as adapting to a changing climate and pressures of population growth that could have a retarding impact. It is also difficult to forecast these changes with any certainty.

11.5.76 The current receptor importance criteria presented in **Table 11-21** is largely based on the presence or not of various attributes (e.g. Drinking Water Protected Area, designated nature conservation site or WFD designation) and flow (i.e. the size of the watercourse). The application of these criteria is therefore not sensitive to more subtle changes or improvements in water quality as may be experienced over time. Thus, no significant changes to current baseline conditions are predicted for the future baseline, as the principal reasons for differences in water body importance are unlikely to change. For this reason, the impact assessment within this chapter is undertaken against existing baseline conditions.

11.5.77 By 2027 it is assumed that population growth and increased development will have resulted in increased pressure upon surface water features from people, property, and infrastructure for water supply and for the dilution and removal of waste products. It is therefore anticipated that water abstractions and discharges will be of slightly larger volumes. However, given that the future baseline year is only four years later than the current baseline, this increased pressure is unlikely to result in a considerable change to the baseline.

Operation

11.5.78 The same future baseline conditions expected during construction will apply to the operation phase (i.e., all WFD targets are met, improving water quality, no change in the presence and status of designated sites).

11.5.79 The wider area around Immingham is allocated in the local plan for industrial development, and if the Proposed Development was not progressed, then another form of development would likely take its place, or it is assumed that the Site would be left in its current state.

Decommissioning

11.5.80 The pipeline will be designed for a minimum operational life of 25 years, and it may be possible for measures to be taken to extend its operational lifecycle. It is considered that continued environmental improvements, tighter regulation at both national, regional, and

local scales, and environmental enhancements would lead to a gradual improvement over current baseline conditions in terms of water quality.

11.5.81 Climate change has the potential to significantly impact on drainage and flood risk and thus it is important that it is taken into account by the Proposed Developments FRA (*ES Volume IV: Appendix 11.5 (Application Document 6.4.11.5)*). However, the design of the Proposed Development will incorporate the climate change projections required by the Environment Agency to ensure that potentially increased surface water flows are accounted for and managed across the lifetime of the Proposed Development.

11.6 Development Design and Embedded Mitigation

11.6.1 EIA is an iterative process which informs the development of the Proposed Development design. Where the outputs of the preliminary assessments identified likely significant effects, changes to the design can be made or mitigation measures can be built-in to the proposal to reduce these effects. This type of mitigation is defined as embedded mitigation, as mitigation measures which have been identified and adopted as part of the evolution of the Proposed Development design ('embedded' into the Proposed Development design). The design of the Proposed Development has been further developed to reflect the findings of ongoing environmental studies, comments raised during the statutory consultation and ongoing engagement with stakeholders. As the design has developed, embedded mitigation measures have been refined as part of an iterative process. This mitigation can be found in *Chapter 3: Description of the Proposed Development* (*ES Volume II (Application Document 6.2.3))* and for the purposes of this ES has been detailed in **Table 11-22.**

11.6.2 Another form of mitigation may be referred to as 'standard' mitigation. Standard mitigation is typically associated with temporary works and is used to describe those measures that are commonly applied by Contractors to ensure a minimum level of protection of the water environment. Although there is no formal description of what is considered 'standard' in this context, it is generally accepted that routine measures to manage the risk of water pollution on construction sites from contaminated water or chemical spillages, physical damage to water features, and flood risk. These measures are typically described in environment agency pollution prevention guidance documents and industry good practice, which are listed later. Standard mitigation measures have been taken into account in the initial impact assessment with the measures secured through the Draft CEMP (see *ES Volume IV: Appendix 3.1 (Application Document 6.4.3.1))*, where they are presented alongside any 'additional mitigation' (Section 11.8) that is project specific and not routine.

11.6.3 Additional mitigation is that which has been proposed to ameliorate the effects of certain impacts where this is required, especially to avoid significant adverse effects and ensure compliance with environmental legislation and planning policy. Additional mitigation also sets out specific pollution prevention mitigation measures and monitoring that are more stringent than the 'standard' mitigation. Additional mitigation is referred to in this chapter (Section 11.8) and also in the Draft CEMP (see *ES Volume IV: Appendix 3.1 (Application Document 6.4.3.1)).*

Construction

11.6.4 The Description of the Proposed Development (*ES Volume II: Chapter 3 (Application Document 6.2.3))* and also the Draft CEMP (see *ES Volume IV: Appendix 3.1 (Application Document 6.4.3.1)* set out standard and good practice construction management measures that will be put in place to manage impacts on the water environment during the construction phase. For the purposes of this assessment, it is assumed that the principles and measures set out in **Table 11-22** that are specific to the Proposed Development will be required of any contractors undertaking construction work in relation to the Proposed Development.

11.6.5 Where possible, the design has sought to avoid impacts to the more important and sensitive water environment receptors through use of trenchless pipeline crossings, and bailey bridge access crossings. The considerate placement and design of construction features has also sought to avoid areas at risk of flooding, key flood protection features, protected areas, and more important and sensitive watercourses.

Operation

11.6.6 A drainage strategy has been produced (*see ES Volume IV: Appendix 11.3 (Application Document 6.4.11.3)*) as part of this planning application, furthermore ahead of construction, pre-commencement surveys would be undertaken which include detailed drainage surveys, and a pre-construction and post-construction land drainage schemes would be produced.

11.6.7 Due to the pipeline operating underground, with appropriate cover, impacts on the water environment during its life cycle is expected to be minimal and related to the drainage for the Block Valve Stations and the Immingham and Theddlethorpe facilities only. This would be managed through the Drainage Strategy. Please refer to **Table 11-22** for more information.

Decommissioning

11.6.8 An initial Draft Decommissioning Strategy has been developed for the Proposed Development and is presented in *ES Volume IV: Appendix 3.5 (Application Document 6.4.3.5)*. The Proposed Development has a minimum operational life of 25 years, which may be extended further. At the end of the Proposed Development's operations, the pipeline and associated infrastructure would be decommissioned.

11.6.9 The base case is that the pipeline will be left in-situ along its entire length, therefore the impacts associated with the decommissioning phase are related to the removal of above-ground facilities.

11.6.10 The decommissioning strategy would apply to the Immingham Facility, the pipeline between Immingham and Theddlethorpe, the Block Valve Stations, the Theddlethorpe Facility and the Dune Isolation Valve. Removal of the infrastructure at Immingham and Theddlethorpe plus the block valve station removal could take between 6-12 months dependent on sequencing of the works.

11.6.11 Those embedded mitigations relevant to the water environment are detailed in **Table 11-22.**

Table 11-22: Embedded and Standard Mitigation

Topic	Mitigation	Mitigation Type	Secured in DCO via
Pre-Construction			
Preparation of working width for the pipeline	The standard working width of the pipeline spread would be 30 m, this may differ at water crossings (may reduce to approximately 10m) or increase prior to HDD crossings.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	Topsoil will be stripped, in accordance with the Outline Soil Management Plan (*ES Volume IV: Appendix 10.1 (Application Document 6.4.10.1)*).	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)* Draft CEMP - *ES Volume IV: Appendix 3.1 (Application Document 6.4.3.1)* Outline Soil Management Plan – *ES Volume IV: Appendix 10.1, (Application Document Ref. 6.4.10.1)*
	Other than at open-cut crossings and fluming of watercourses for temporary access, a buffer zone between the edge of the works and any water features will be maintained. Within this zone there will be no vegetation clearance, topsoil stripping or any other works. The size of this zone will be dependent on the type, maturity and quality of the vegetation and habitats in the vicinity of the watercourse and could be up to 10 m in width. This mitigates the risk of surface water runoff carrying silt from the working area entering the watercourse, by creating a barrier. If required, this could be supplemented using silt fencing or other suitable barriers across the width of the working area.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*

Topic	Mitigation	Mitigation Type	Secured in DCO via
	Temporary drainage measures will be constructed by the Contractor as necessary and using methods in keeping with good practice guidance (e.g. where there is a risk of sediment or other pollutants entering water features or where existing drainage measures are interrupted) as described in the oWMP (*please refer to ES Volume IV: Appendix 11.6 (Application Document 6.4*). These schemes could include the installation of new drainage to intercept existing land / field drainage which would be severed by the pipeline. Construction SuDS and proprietary measures as required will be used to manage the risk from site runoff to any nearby surface water features (e.g. buffer strips, earth bunds, silt fences, straw bales, small settlement lagoons etc.)	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
Formation of Construction Compounds	Construction compounds will be sited outside of the 10 m buffer zone.	Standard Practice	Standard Practice
	Drainage measures will be constructed (where required). These schemes could include the installation of new drainage to intercept existing land / field drainage which would be severed by the compounds.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	Hazardous liquids such as diesel fuel will be securely stored on flat hardstanding with interception of surface water drainage so that it can be treated prior to discharge (using either SuDS or proprietary measures). Fuel will be protected either by double-walled tanks or stored in a bunded area with a capacity of 110% of the maximum stored volume. Smaller quantities of chemicals will be stored in lockable containers. Spill kits would be located nearby.	Standard Practice	Draft CEMP- *ES Volume IV Appendix 3.1 (Application Document 6.4.3.1)*
	A temporary drainage system for the compound area will be prepared. This may involve cut-off drains around the perimeter and construction SuDS for attenuation and treatment of runoff prior to discharge from the Site. Where necessary proprietary measures may also be used. The Environment Agency will be consulted prior to setting up the	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*

Topic	Mitigation	Mitigation Type	Secured in DCO via
	compounds to ensure that any consents are obtained (e.g. Water Activity Permit).		
	Wheel wash facilities will be utilised at construction compounds and Immingham and Theddlethorpe Facilities to reduce mud traction on roads.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	Where practicable, utility supplies will be taken from main supply utility connections, however where this is not possible, utilities will be provided from temporary facilities such as water bowsers, local waste water storage and transport of waste and wastewater to an approved off-site disposal point	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	Provision of potable water, emptying of effluent and the removal of any waste would be undertaken by a registered contractor on a regular basis.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
Construction			
General	Other than at open-cut crossings and fluming of watercourses for temporary access, a buffer zone between the edge of the works and any water features will be maintained. Within this zone there will be no vegetation clearance, topsoil stripping or any other works. The size of this zone will be dependent on the type, maturity and quality of the vegetation and habitats in the vicinity of the watercourse and could be up to 10 m in width. This mitigates the risk of surface water runoff carrying silt from the working area entering the watercourse, by creating a barrier. If required, this could be supplemented using silt fencing or other suitable barriers across the width of the working area.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	Drainage measures will be constructed (where required). These schemes could include the installation of new drainage to intercept existing land / field drainage which would be severed by the compounds.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*

Topic	Mitigation	Mitigation Type	Secured in DCO via
	Topsoil and subsoil will not be stored directly adjacent to the watercourse but will be moved further along the working area to reduce the risk of silt laden runoff reaching the watercourse.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	Typically, crossings of main rivers/ditches, canals, and sensitive water features, are installed by trenchless methods. However, the majority of small watercourses, drains and ditches will be crossed using open-cut methods. The crossing schedule is provided in *ES Volume IV: Appendix 3.2 (Application Document 6.4.3.2))*. The crossing schedule has been developed iteratively as the design has progressed and with consultation with key stakeholders (see Table 11-3 to Table 11-5 for details of consultation). The resulting key principle is that all WFD main channels, chalk streams and Main Rivers are to be trenchless for the pipeline crossing, and are either not crossed by the access road or will be crossed by open span bailey bridges. There was an initial preference for trenchless crossings for IDB watercourses, however due to the number of crossings this would extend the timeline of construction significantly, and therefore would likely result in increased effects to the water environment due to ongoing construction measures such as the access track. Therefore, open-cut methods and flumed crossings for temporary access are generally proposed. Field drains and ephemeral waterbodies are open-cut with flumed crossings for temporary access. Additional mitigation measures are recommended where open-cut methods may result in impacts to sensitive waterbodies downstream (see Section 11.8 and Section 11.9).	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)* Draft CEMP - *ES Volume IV: Appendix 3.1 (Application Document 6.4.3.1)*
	Specific crossing locations will be micro-sited to make the crossing as close to perpendicular to the watercourse as reasonably practicable, ensuring the crossing is as short as	Embedded mitigation	Draft CEMP - *ES Volume IV: Appendix 3.1 (Application Document 6.4.3.1)*

Topic	Mitigation	Mitigation Type	Secured in DCO via
	possible and for open cut / temporary access crossings reducing the risk of localised scour at the structures.		
	Dewatering of the trench and other excavations may be required in some areas to stabilise the surrounding ground during construction. Water would never be pumped directly to a watercourse, be allowed to directly enter a watercourse, or be discharged to ground.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	Drainage measures will be constructed (where required). These schemes could include the installation of new drainage to intercept existing land / field drainage which would be severed by the pipeline.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	Occasionally it may be necessary to remove water from the trench and excavations and this will be carried out using portable pumps. Temporary tanks (typically clay plugs) would be created within the trench prior to undertaking dewatering/draining activities, to prevent migration of water within the trench. Water will be discharged strictly in accordance with a water management plan prepared by the Pipeline Contractor and will be filtered using a variety of techniques that may include silt netting, straw bale filtration barriers, temporary settlement lagoons, silt socks over pump discharge hoses and silt busters (purpose designed filtration tanks).	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
Secondary consents	Dewatering of the trench and other excavations may be required in some areas to stabilise the surrounding ground during construction. This activity would be subject to a Water Resources Abstraction Licence (unless the activity is exempt under The Water Abstraction and Impounding (Exemptions) Regulations 2017) and an approved Permit to Pump would be required for all pumping operations (before dewatering or discharges commence).	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*

Topic	Mitigation	Mitigation Type	Secured in DCO via
	All works within 10 m of Main Rivers will require Flood Risk Activity Permits (FRAPs), and all works that may affect the flow within Ordinary Watercourses will require Land Drainage Consents from the LLFA (IDB or council).	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	A schedule of the anticipated consents and licences required for the Proposed Development are provided within the *Consents and Other Licences Required (Application Document 7.2).*	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	The above consents, and any further consents and licences required for the Proposed Development, will be obtained prior to the works taking place.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
Horizontal Directional Drilling (HDD)	The FEED for HDD will include depth and profile and consider methods to reduce the risk of groundwater breakout during drilling.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	Any surplus drilling fluid will be removed off-site for recycling and/or disposal. Contingency plans will be in place to deal with any indications of drilling fluid release.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	In total, there are currently expected to be 22 watercourses being crossed by HDD techniques along the pipeline.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
Auger bore, including guided	Auger boring is a technique where a pipe is pushed into the ground whilst the soil at the front face is cut away by an auger which also moves the excavated material back along the pipe.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	In areas of auger boring, the working width would need to be widened to accommodate the extra equipment required, though this would be accommodated within the Limits of Deviation.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*

Topic	Mitigation	Mitigation Type	Secured in DCO via
	The pipeline at auger bore crossing locations will be installed at typical depths of between 4 m and 6 m but are very unlikely to exceed 10 m.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	In total, there are currently expected to be approximately 36 watercourses being crossed by auger bore techniques along the pipeline.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
Open cut crossing	Within the defined zone, the working width will be reduced to a safe construction width that may be as narrow as 10m dependent upon the specific crossing location. The boundary of the narrowed working area will be defined with fencing to prevent encroachment onto the watercourse banks beyond the working width, but fencing will not be placed down the banks or within the watercourse.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	In-stream vegetation within the crossing area would be temporarily translocated within the watercourse slightly upstream or downstream of the works and will be returned to its original position as part of the reinstatement. The bed material will also be stored separately and used for reinstatement.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	In total, there are currently expected to be 89 watercourses being crossed by open cut crossings along the pipeline.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
Haul roads and laydown areas	The temporary access tracks which lead to the pipeline spread and the running track itself would have the topsoil removed and stored to one side. Upon completion of construction, these tracks will be levelled, and the topsoil replace.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*

Topic	Mitigation	Mitigation Type	Secured in DCO via
	Topsoil will be placed at least 20m away from water features and further or with added barrier protection such as silt fences if the terrain is sloping subject to on site risk assessment.	Embedded mitigation	Draft CEMP - *ES Volume IV: Appendix 3.1 (Application Document 6.4)*
	Depending on ground conditions and weather conditions a geotextile membrane and stone surface and/or bog-mats may be used in selected areas.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	The Proposed Development may include a system of 'cut-off' drains which feed into a new header drain and the scheme will also take into account surface water runoff mitigation measures. Where necessary, field drainage would be newly installed or restored elsewhere.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	Appropriate site layout and housekeeping measures would be implemented by the contractor(s) at all construction locations. These may include: Suppressing windblown dust on open areas of land or due to moving vehicles/plant using water spays or similar; Minimising transfer or accumulation of mud onto roads by using wheel washing/cleaning facilities or road sweepers as appropriate; Prior to the complete of the works, all hardstanding materials shall be removed, and the area fully reinstated to their original condition.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
Flumed crossings	Where watercourses are encountered that require the passage of construction traffic, measures to be applied include the use of 'flume' pipes. Flume pipes are temporary pipes placed in the watercourse to allow the flow of water through the pipe.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	Both ends of the flume pipe, starting at the upstream end, will be sealed to the banks using a clay plug or a proprietary system such as Aquadam. This will ensure that all water is	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed*

Topic	Mitigation	Mitigation Type	Secured in DCO via
	then directed through the flume pipe to maintain the flow of the watercourse during the open cut installation. If required, scour protection will be placed at the downstream end of the flume to reduce the risk of bed erosion.		*Development (Application Document 6.2.3)*
	When works in the area are complete, the materials used to create the haul road will be removed. The seal around either end of the flume pipe will be slowly removed to allow the gentle return of the watercourse flow and then the flume removed.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	The length of flume pipes will be oversized (by a 1-2 m) either side of the length of watercourse being temporarily crossed for access to provide protection from material that may fall into the channel from the haul road. The diameter of the pipes will be estimated based on an assessment of flow characteristics of the watercourse under peak flow conditions. The assessment of this will be undertaken pre-construction.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)* Draft CEMP - *ES Volume IV: Appendix 3.1 (Application Document 6.4)*
	In-stream vegetation within the crossing area would be temporarily translocated within the watercourse slightly upstream or downstream of the works and will be returned to its original position as part of the reinstatement. The bed material will also be stored separately and used for reinstatement.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
Temporary bridge crossings (bailey bridges)	On wider, more significant watercourses a temporary bridge spanned bridge (Bailey type bridge) will be installed to prevent temporary losses of riparian zones.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
Immingham and Theddlethorpe Facility's and Block Valve Station Installation	Surfaces would be constructed to falls, so that rainwater can drain to existing open ground, to soakaways or to existing drainage facilities, as appropriate. Most of the sites would be permeable surface to minimise runoff. Swales and soakaways will be utilised to promote sustainable drainage.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*

Topic	Mitigation	Mitigation Type	Secured in DCO via
	Cut-off drainage channels will be provided at the site entrance gates.		
	Roads and hardstanding would have flush concrete kerbs to allow surface water run-off.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	Appropriate construction management practices, including minimising work and the storage of construction materials/plant in the floodplain.	Standard Practice	Draft CEMP - *ES Volume IV: Appendix 3.1 (Application Document 6.4)*
	Construction works should not be undertaken during periods of heavy rainfall.	Standard Practice	Draft CEMP - *ES Volume IV: Appendix 3.1 (Application Document 6.4)*
Hydrostatic testing	The quality of the water used for hydrostatic testing will be tested before it is pumped into the pipeline section.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	The water within the pipeline will be tested again before it is discharged to another pipeline test section to be re-used, discharged locally in accordance with discharge permits or emptied into a road tanker to be disposed of.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	Hydrostatic testing of each individual test section will progress as the test sections become available and in accordance with the detailed construction plan. The total estimated of water required for the hydrostatic testing is 6642.7m^3.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
Operation			
Immingham and Theddlethorpe Facility's and Block	The majority of the sites would be permeable surface to minimise runoff. Gravel would be spread over the site, and the outer strips planted up.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*

Topic	Mitigation	Mitigation Type	Secured in DCO via
Valve Station Installation Drainage	Surfaces will be constructed to falls so that rainwater can drain the appropriate drainage system where required.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	Roads and hardstanding will have flush concrete kerbs to allow surface water run-off. The majority of the sites will be permeable surface to minimise runoff.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	A cut-off drainage channel will be provided at the Immingham and Theddlethorpe Facility site entrance gates to control runoff offsite and onto site.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	Swale channels are proposed to capture and convey runoff from the facilities access roads and roofs.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
	The results from the mitigation indices (*see ES Volume IV: Appendix 11.3* (*Application Document 6.4*)) indicate the use of swales will provide adequate treatment of surface water runoff.	Embedded mitigation	Drainage Strategy - *ES Volume IV Appendix 11.3: (Application Document 6.4.11.3).*
	A full operation and maintenance document will be provided at the detail design stage of the use of SuDS.	Standard Practice	Drainage Strategy - *ES Volume IV: Appendix 11.3 (Application Document 6.4.11.3).*
	Maintenance activities will be in accordance with industry good practice of CIRIA SuDS Manual and will be inspected at defined intervals and before and after major storm events.	Standard Practice	Drainage Strategy - *ES Volume IV Appendix: 11.3 (Application Document 6.4.11.3).*
	For the block valve stations, site surveys will be undertaken to understand if any land drainage systems exist beneath the site or within the vicinity. Consideration of land drainage is required to ensure it is not disrupted by the construction of	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*

Topic	Mitigation	Mitigation Type	Secured in DCO via
	the facilities and stations. This will allow the facility and stations and surrounding land to continue to drain as per the existing drainage regime with the incorporation of infiltration trenches.		Drainage Strategy - *ES Volume IV: Appendix 11.3 (Application Document 6.4).*
	There are no proposed welfare requirements at any of the facilities. The only exception is an emergency shower at Immingham, where water for emergency shower will be supplied by VPI.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
Decommissioning			
Removal of Immingham and Theddlethorpe Infrastructure	Removal of the infrastructure at Immingham and Theddlethorpe plus the block valve station removal could take between 6-12 months dependent on sequencing of the works.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*
Removal of pipeline	The base case is that the pipeline will be left in-situ along its entire length. Special consideration will however be given to key locations such as road and railway crossings. At such locations agreed methodologies between relevant stakeholders will be employed to ensure the pipeline is left in a suitable condition; this may involve cutting out or grout filling sections of pipeline.	Embedded mitigation	*ES Volume II: Chapter 3 Description of the Proposed Development (Application Document 6.2.3)*

11.7 Potential Impacts and Assessment of Effects

Introduction

11.7.1 This section of the chapter considers the potential effects that the construction of the Proposed Development could have on the water environment. The main potential impacts relating to construction, operation and decommissioning are:

- Increased surface water runoff through increases in impermeable or compacted areas;
- Mobilisation of fine sediment affecting water quality through runoff or scour;
- Impacts to hydromorphology of watercourses;
- Release of oils and / or other chemicals affecting water quality;
- Temporary flow obstructions from open cut and culverting at crossings, and associated effects of dewatering affecting flow regime; and
- Severance or disturbance to underground field/land drainage infrastructure.

11.7.2 The assessment is undertaken here on a watercourse-by-watercourse basis given the number of receptors that require considering and that many watercourses can be impacted by different elements of the Proposed Development. These impacts are discussed in further detail in the sections below and in **Table 11-23**. As multiple watercourses may be impacted by works simultaneously, the cumulative effects of this are also considered in this section and in the cumulative effects section (Section 11.11).

Assessment of Potential Impacts: Construction Phase (including pre-construction phase)

General Overview

11.7.3 Where construction works are undertaken in close proximity to watercourses, impact existing land drains (that provide a pathway to watercourses), or further afield but on steeper terrain angled towards a water feature, there is the potential for adverse effects on water quality due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals spilt on site. Direct works within watercourses can also have impacts on the morphology or the watercourse or result in changes to flood risk. Active dewatering of excavations can also be a possible source of pollution and may result in changes to flow. These impacts may affect the immediate receiving water feature but may also propagate downstream.

11.7.4 The impacts and effects related to works of the Proposed Development are detailed below.

Construction Compounds, Immingham and Theddlethorpe Facility's and Block Valve Stations

Northern, Central and Southern Construction Compounds

11.7.5 Although the formation of the compounds is considered to be a part of the 'Pre-Construction Phase', they will be in use during all of the Construction Phase and are therefore considered a part of this assessment. The compounds are:

- ***Northern Compound –*** located to the south of Habrough Roundabout and the A160, approximately 21,500 m^2 in area. This is greenfield land (arable) and would be used as a main construction compound and pipe storage area. Access would be via Harborough Road;

- ***Central Compound –*** located near Welbeck Hill to the east of Barton Street (A18), approximately 17,100 m^2 in area. This would be used as a construction compound and would act as the main pipe / material storage area; and
- ***Southern Compound –*** located at the car park on the former TGT site, approximately 13,000 m^2. This would be used predominantly as a pipe storage area.

11.7.6 The construction compounds will serve as a point for accessing deliveries of and storage of pipe and other materials / equipment. The impacts associated with the setting up of the compounds will be from the removal of topsoil and the use of heavy machinery (however the Southern Compound is already hardstanding and therefore no topsoil would be removed and is therefore not considered to have impacts associated with topsoil removal). This has the potential to cause a reduction in water quality through sediment disturbances if washed down into watercourses.

11.7.7 Discharge of fine sediments can have many impacts on water quality, morphology and aquatic ecosystems. An increase in turbidity can have direct physical impacts on aquatic organisms and reduce light availability preventing photosynthesis by aquatic plants leading to reduce dissolved oxygen levels. Fine sediments may also be deposited smothering plants, the bed and morphological features. The sediment particles can also be a vector for the conveyance of chemical pollutants, with hydrocarbons known to have a strong affinity to sediment. Overall, excess fine sediment leads to negative impacts on local fluvial geomorphology, ecological and physio-chemical water quality and over time can lead to a potential reduction in the WFD classification.

11.7.8 This discharge could also contain the spillage of oils, fuels and other construction chemicals which may propagate down into the water feature which affect physio-chemical water quality elements. These impacts are likely to be exacerbated by the increase in impermeable area of the compound through increased run-off rates.

11.7.9 The embedded mitigation (Section 11.6) states that the topsoil and subsoil will be moved to the edge of the working area and will not be stored directly adjacent to any watercourses (minimum 20 m from the top of the bank surrounding a watercourse) to reduce the risk of silt laden run-off and will be managed to maintain the nature of the soils, with measures taken to prevent soil loss due to erosion. Furthermore, temporary drainage schemes will be constructed where they are required. Fuels, and chemicals will be stored in a bunded area with a capacity of 110% of the maximum stored volume, with spill kits located nearby. With this embedded mitigation, impacts from run-off are predicted to be short term, intermittent and spatially local.

Immingham and Theddlethorpe Facilities, Block Valves and Dune Isolation Valve

11.7.10 The Immingham Facility will be located on a brownfield land to the south of the existing VPI Immingham site.

11.7.11 There are currently two options for the location of the Theddlethorpe Facility:

- Option 1: new facility at the former Theddlethorpe Gas Terminal (TGT) site. Access to the site would be via an existing gate at the south west corner of the site; and
- Option 2: new facility to the west of the former TGT site, located on arable land directly west of The Cut (an ordinary / IDB watercourse). This facility would be accessed from the north off the A1031 Mablethorpe Road.

11.7.12 There are three block valve stations required along the pipeline route to enable pipeline sections to be isolated for operational and maintenance reasons. The three Valve stations are known as:

- Block Valve Station 1 – Washingdales Lane Block Valve;

- Block Valve Station 2 – Thoroughfare Block Valve; and
- Block Valve Station 3 – Louth Road Block Valve.

11.7.13 There is an existing isolation valve (Dune Isolation Valve) on the onshore section of the LOGGS pipeline, located close to the sand dunes to the east of the existing TGT site, which was used as an isolation valve for Theddlethorpe when importing gas from offshore. A new valve will be provided in the same location.

11.7.14 The main impacts associated with the construction of the facilities and valves will be from the removal of topsoil, construction of drainage measures and earthworks to establish foundation levels. These have the potential to cause a reduction in water quality through sediment disturbances if washed down into watercourses as described for construction compounds.

11.7.15 The embedded mitigation (Section 11.6) states that the topsoil and subsoil will be moved to the edge of the working area and will not be stored directly adjacent to any watercourses to reduce the risk of silt laden run-off (minimum 20 m from the top of the bank surrounding a watercourse) and will be managed to maintain the nature of the soils, with measures taken to prevent soil loss due to erosion. Furthermore, drainage schemes will be constructed where they are required. Fuels, and chemicals will be stored in a bunded area with a capacity of 110% of the maximum stored volume, with spill kits located nearby. With this embedded mitigation, impacts from run-off are predicted to be short term, intermittent and spatially local.

Pipeline Route

Haul Roads and Major/Minor Laydown Areas

11.7.16 A haul road, known as a running track, will be constructed along the entire working width where practicable to allow the passage of vehicles, plant and materials/pipe. The construction of a haul road will be impracticable within HDD areas; therefore, access points will be created in these locations. It is intended that the haul road will be constructed onto the sub-soil but depending on ground conditions and weather conditions a geotextile membrane and stone surface and/or bog-mats may be used in selected areas to enable traffic movements without causing excessive erosion and rutting of the ground.

11.7.17 Within the working areas made available at road crossings, an adequate number of temporary hardstanding laydown areas (minimum 400 m^2 at each location) shall be constructed and maintained, including all necessary temporary work in culverting to ditches, surface drainage, temporary fencing, etc. These lay-by areas are for vehicle manoeuvring and car parking by construction operatives and all others who, in the course of their activities, visit the working width in connection with the works. Vehicles shall not be parked on roadsides or verges at or near crossings.

11.7.18 The regular movements of heavy vehicles/plant on the haul roads and laydown areas have the potential to temporarily mobilise soil and may also be surfaces upon which chemical spillages occur (e.g. fuel spills, oils, and lubricants). Furthermore, there is a risk of aggregate (such as sand) falling from trucks and vehicles, which may be washed off into watercourses. At sufficient concentrations, particulate and chemical pollutants could lead to a reduction in water quality resulting in adverse effects on aquatic ecosystems as well as affecting flow.

11.7.19 The embedded mitigation (Section 11.6) to address the impacts of sediment-laden runoff through proper storage of the topsoil away from water features thus reducing the risk of sediment entering them. In terms of the laydown areas, these will have appropriate temporary drainage provided such as cut-off drains. Intercepted surface water runoff from the construction site will be treated to filter or allow fine sediments to settle out prior to being discharged to ground or a watercourse, in accordance with a Water Activity Permit from the Environment Agency as required.

11.7.20 Spillages from fuels and other chemicals will be managed by double-walled storage and bunded storage areas with spill kits located nearby the at-risk chemicals. Staff will be trained in the use of spill kits and all refuelling of plant and hand held equipment will be done in designated areas of compounds wherever possible (on hard standing) or if elsewhere from mobile bowser, at least 20 m from any water feature, on flat /level ground, and with drip trays and plant nappies in place to capture small leaks. With associated embedded mitigation, the impacts from runoff and chemical spillages are predicted to be of local spatial extent, short term duration, intermittent occurrence and reversible.

Flumed Crossings (access and pipe installation)

11.7.21 Where watercourses are encountered that require the passage of construction traffic and it is proposed to install the CO2 pipeline using an open-cut method, measures to be applied include the use of 'flume' pipes. Flume pipes are temporary pipes placed in the watercourse to permit the flow of water through the pipe. The access track will be across the top of the flume pipe, and the pipe will be installed with an open-cut methodology beneath the flume pipe (see below section).

11.7.22 To install the pipeline, initially in-stream vegetation within the crossing area would be temporarily translocated within the watercourse slightly upstream or downstream of the works. The flow in the channel will then be temporarily dammed while the flume pipe is inserted. The access track will be constructed across the top of the pipeline.

11.7.23 The impacts associated with the flume crossing primarily come from changes in flow dynamics and patterns of erosion. Temporary removal of the bed substrate (that will be stored separately for replacement after completion of the works) and installation of the temporary culverts can encourage material to be deposited upstream of culvert and scour of the bed and / or banks downstream where there is a material deficit (due to changes in flow).

11.7.24 To mitigate these impacts, flume pipes will be sized to reflect the span width and the estimated flow characteristics of the watercourse under peak flow conditions. To make sure that all water is directed through the flume pipe to maintain the flow of the watercourse during the open cut installation, both ends of the flume pipe, starting at the upstream end, will be sealed to the banks using a clay plug or a proprietary system such as Aquadam. If required, scour protection will be placed at the downstream end of the flume to reduce the risk of bed erosion. This option will allow free passage for fish and eels whilst also trying to minimise erosion and sediment inputs into the watercourse and providing water quality protection by creation of a 'dry' working area.

11.7.25 A pre-works hydromorphological and ecological survey will be carried out to inform reinstatement of the channel and landscaping works following completion of the works (both for temporary access and open-cut pipeline installations). The removed bed substrate will be replaced in the channel and in-stream vegetation relocated to its original location, where possible.

Temporary Spanned Bridges

11.7.26 Where installation of a flume pipe crossing is not possible, such as in HDD crossings or sensitive watercourse crossings, then a temporary spanned bridge (Bailey type bridge) can be installed. This requires the construction of a raised soil platform each side of the watercourse (set back from the watercourse banks) before a temporary bridge structure is lifted onto the spoil platform. In comparison to the flumed crossings, the spanned bridge reduces the loss of riparian and marginal vegetation, and fish and invertebrate habitats.

11.7.27 Generally, the use of a clear-span temporary bridge will be minimal impact on the flow in a watercourse. However, if the bridge is placed in a location suffering from scour, it will force additional load onto banks, which has the potential to exacerbate destabilisation and further

bank collapse. Equally, locating the structure on a meander bend may lead to flows directed towards the supports. This may exacerbate fine sediment delivery in the short term into the channel as banks may be destabilised leading to bed structure and substrate changes locally from smothering of bed and morphological features downstream. These locations should be avoided when siting temporary bridge structures. These bridges are also to be built perpendicular to the flows and set away from the banks to reduce sediment inputs to the water features. Good practice of sediment management associated with the raised soil platforms, including the adoption of the SMP, minimising soil stripping, and use of erosion control measures, will reduce the impacts associated with the bridges therefore the impacts are expected to be spatially local and of short-term duration.

Open Cut Techniques

11.7.28 This crossing technique is the default installation method, unless otherwise identified. This involves digging a trench directly across the asset or infrastructure to be crossed, noting that where this technique is used for a watercourse the watercourse will be flumed, as described earlier. Once flow is passing along the flume pipe, a trench will be dug to a depth necessary to ensure adequate depth of cover below clean true bottom/hard bed of the watercourse. A short section of the pre-bent CO2 pipe is then installed by passing it under the flume pipe, and the trench backfilled with the graded excavated material. The surface is then reinstated with appropriate material. Due to the depths of the excavations, dewatering may be required to stabilise the surrounding ground during construction.

11.7.29 The impacts during construction from this technique and its associated machinery could lead to an increase in soil erosion which created sediment laden run-off from the excavation pits, construction vehicles and access roads. This direct work will also disturb the bed and banks of the watercourses. Furthermore, there are a small number of wooded areas through which the open-cut excavation will pass where trees will need to be cut. This may exacerbate fine sediment delivery through bank destabilisation leading to the bed structure and substrate changes. These all have the potential to cause a reduction in water quality and hydromorphological function through sediment disturbances if washed down into the watercourses and drains, alongside the spillage of oils, fuels, and other construction chemicals.

11.7.30 Embedded mitigation as discussed in Section 11.6 includes measures to ensure that incidental release of sediments or runoff is minimised, and that surface water discharge is fully controlled in terms of water quality and volume. Therefore, the impacts associated with these techniques are considered to be spatially local and of short-term duration.

Trenchless (HDD, Auger bore and micro-tunnelling)

11.7.31 HDD is a trenchless crossing technique where the pipeline is fitted under the watercourse in the shape of a smooth curve up to 20m below from an entry and exit point. The depth of the crossing would be dependent upon the specific crossing location.

11.7.32 The footprint required for the HDD works is greater than that required for an auger bore due to the ancillary equipment (including control cabins) required for this technique. Therefore, the working width would need to be widened immediately adjacent to the crossing to accommodate extra plant. Excavations (to a size detailed in the site-specific design, normally approximately 2 m deep and 3 m x 3 m in area) will be made by mechanical excavator at both the drill entry point (launch pit) and the drill exit point (reception pit) to contain drilling fluids at each end of the drill path.

11.7.33 Auger boring is a technique where a pipe is pushed into the ground from a launch pit to a receiver pit, whilst the soil at the front face is cut away by an auger which also moves the excavated material back along the pipe.

11.7.34 Trenchless techniques will avoid any direct effect on the structure of the watercourse by drilling beneath the bed, as well as generally avoiding direct water quality impacts. This would also eliminate any longer term affects to fluvial geomorphology as flows, movement of sediment and fish migration will be unaffected. However, temporary compounds (including launch and receptor pits) would be required either side of the watercourses, in addition to construction vehicles and access roads nearby. These activities could lead to an increase in soil erosion resulting in sediment laden runoff due to the excavations needed. This discharge could also contain spillages or leaks of drilling fluids (that can also 'frac-out' under the bed), fuels and oils, or other pollutants that could affect nearby watercourses or standing water quality.

11.7.35 It's not currently anticipated that the micro-tunnelling crossing technique will be required. However, if it is adopted during construction, it will require a similar working footprint to the guided auger bore requirements.

11.7.36 The impacts from runoff are predicted to be of local spatial extent, short term duration, intermittent occurrence and reversible. Embedded mitigation as discussed in Section 11.6, includes measures to ensure that incidental release of sediments or runoff is minimised, and that surface water discharge is fully controlled in terms of water quality and volume before entering the receiving water feature. The relevant permits and consents for such activities as construction near water, abstraction and discharging of water will be sought from the Environment Agency, Lead Local Flood Authority / Internal Drainage Board (IDB) / Canal and River Trust where necessary.

Hydrostatic Testing

11.7.37 After the pipeline sections are cleaned and gauged, they will be subjected to a hydrostatic test. Temporary test ends will be welded or bolted to both ends of the pipeline section which is then filled with water and pressurised to a pressure well in excess of the maximum pressure it will ever be subjected to during operation, and normally for a period of 24 hours. The pipeline sections at the Immingham and Theddlethorpe Facilities will be tested separately.

11.7.38 Currently it is estimated that around 6,500 m^3 of water will be required for hydrostatic testing. The main option currently being explored for the source of the water for hydrostatsic testing is from a third-party from outside of the local area and delivered to the site by road-going water tanker. A back -up option of sourcing water from the P66 Site is also currently being explored further but no agreement has yet been made. The pipeline will be split into a number of test sections and test water will be passed from the first section on completion of that test and into the second section for reuse and so on. The quality of the water used for hydrostatic testing will be tested before it is pumped into the pipeline section, and will be tested again before it is discharged to another pipeline test section to be re-used. The water within the pipeline will be tested before being discharged to a watercourse in accordance with a Water Activity Permit or pumped out into road tankers to be disposed of at a licenced waste facility.

11.7.39 The impacts associated with hydrostatic testing include the accidental release of water into local water features, or the potential for the water discharged to a watercourse being contaminated. Embedded mitigation as discussed in Section 11.6 includes measures to ensure that incidental release of contaminated water is minimised, and that surface water discharge is fully controlled in terms of water quality and volume before entering the receiving water feature. Therefore, these impacts are predicted to be of local spatial extent and of short duration and highly reversible.

Flood Risk

Potential risk of flooding from fluvial sources during construction

11.7.40 The assessment of flood risk is based on the FRA, presented in *ES Volume IV: Appendix 11.5 (Application Document 6.4.11.5)*.

11.7.41 The construction phase of the Proposed Development will involve works in areas close to and within the floodplains of numerous watercourses, and several of their tributaries. Should a fluvial flood event occur during construction this could be a significant risk to construction workers in the vicinity of watercourse crossings and on the floodplain, with the greatest risk occurring around the larger watercourses in the study area. For the open-cut watercourse crossings associated with the proposed pipelines there will be construction within the channel itself and many of the pipelines would require construction within the floodplain area, which has potential to interrupt flood flows and create a local backwater.

11.7.42 The baseline fluvial flood risk could be exacerbated during construction works due to:

- A temporary increase in the rate and volume of surface water runoff from an increase in more impermeable areas due to vegetation clearance, site compounds and compacted soils;
- Any on-going in channel works that may reduce the channel capacity or alter the flow patterns within it;
- The presence of earth bunds, stockpiled materials and equipment temporarily stored on the floodplain; and
- Sediment, construction materials and equipment may also be washed downstream where it may block the channel and lead to or increase the risk of flooding.

11.7.43 For these areas of potential flood risk, construction flood mitigation measures would be applied to reduce the risk to the construction site and workers. The standard construction methods and mitigation are described in the Draft CEMP (including the need for the contractor to produce a Flood Warning and Evacuation Plan to cover emergencies (see *ES Volume IV: Appendix 3.1 (Application Document 6.4.3.1)*). Given this mitigation, the risk can be effectively managed (for example by monitoring weather forecasts and Environment Agency flood warnings; by undertaking works close to watercourses during periods of dry weather; by ensuring an adequate temporary drainage system is in place and maintained throughout the construction phase).

Potential risk of flooding from pluvial sources during construction

11.7.44 The Proposed Development will in general be at a low risk from surface water flooding, although in some areas associated with watercourses there are areas of medium and high risk associated with the proposed pipelines and Block Valve Stations. During the works existing surface flow paths may be disrupted and altered due to site clearance, earthworks and excavation work. The exposure and compaction of bare earth and the construction of impermeable surfaces may increase the rates and volume of runoff and increase the risk from surface water flooding.

11.7.45 New areas of hardstanding associated with all of the compounds will be minor and not result in any significant new volume of site runoff. Supported by embedded mitigation measures, such as regular inspections of the drainage associated with the new facilities and block stations (as well as before and after storm events).

11.7.46 A pre-construction land drainage scheme will be designed with the intent of maintaining the efficiency of the existing land drainage system, which will take into account surface water runoff mitigation measures. This will ensure that interruptions to land drainage during construction will be mitigated.

Potential risk of flooding from groundwater sources during construction

11.7.47 The FRA (*ES Volume IV: Appendix 11.5 (Application Document 6.4.11.5)*) indicates that the groundwater flood risk is generally low across the study areas associated with the entire Proposed Development. Groundwater flood risk in the area is primarily due to permeable superficial deposits (e.g., alluvium) which tend to have a relatively high-water table and are in hydraulic connection with the main and/or Ordinary Watercourses in the area.

11.7.48 The risk to construction workers across the Proposed Development site from groundwater flooding will be managed through measures described in the CEMP (*ES Volume IV: Appendix 3.1 (Application Document 6.4.3.1))* and future Construction Dewatering Strategy. These will outline appropriate working practices, plans and equipment required for de-watering to ensure safe dry working environments and safe working in confined spaces (such as the provision of escape routes and banksman to monitor works).

Potential risk of flooding from artificial sources during construction

11.7.49 It is not envisaged that flood risk from drainage infrastructure (e.g., sewers) will increase from the existing situation with the construction of the Proposed Development in any part of the Proposed Development site. This is because new connections to the existing network and pipelines will be adequately managed through standard construction approaches outlined in Section 11.6.

11.7.50 Furthermore, the only area that is at risk of flooding from reservoirs is Section 2 of the DCO Site Boundary, upstream on the Laceby Beck, however the majority of the DCO Site Boundary are not at risk of flooding from artificial sources. Reservoir flooding is a rare event with a low probability of occurrence, due to regular inspections. As such, there is not envisaged to be any impact on flood risk from these artificial sources either on or off-site during construction (i.e. no change).

Potential risk of flooding from tidal sources during construction

11.7.51 During the construction phase there is a risk of displacing floodwater via the storage of materials/plant in the floodplain. For these areas of potential flood risk, construction flood mitigation measures would be applied to reduce the risk to the construction site and workers. The standard construction methods and mitigation are described in the Draft CEMP (including the need for the contractor to produce a Flood Risk Management Plan to cover emergencies (see *ES Volume IV: Appendix 3.1 (Application Document 6.4.3.1))* and are summarised in Section 11.6. Given this mitigation, the risk can be effectively managed (for example by monitoring weather forecasts and EA flood warnings; by undertaking works close to watercourses during periods of dry weather; by ensuring an adequate temporary drainage system is in place and maintained throughout the construction phase and minimal storage of materials / plant in the floodplain). The only two sections of the Proposed Development potential impacted by tidal flood risk are Section 1 and Section 5, as described below.

11.7.52 The 2010 Northern Area Tidal Modelling study includes flood mapping of the present day (2006) overtopping scenario. This data provided by the EA is the most appropriate to use to assess present day overtopping. A review of the flood mapping indicates that during extreme 0.5% AEP event and 0.1% AEP event overtopping of the defences occurs but does not impact the area within the DCO Site Boundary. However, there is a residual risk of breaching of the tidal defences, where depths of up to 1.81 m (0.1% AEP present day flood) could be experienced. Given that this is a residual risk, it is considered that the likelihood of it occurring is very low and can be managed through standard mitigation measures described above (Section 11.6). Therefore it can be concluded that within Section 1, including the Immingham Facility the magnitude of impact of the tidal flood risk is negligible, and the significance of impact is negligible and therefore not significant.

11.7.53 The 2010 Northern Area Tidal Modelling study includes flood mapping of the present day (2006) overtopping scenario. A review of the flood mapping indicates that during extreme 0.5% AEP event and 0.1% AEP event overtopping of the defences occurs along a short section of defence north of the DCO Site Boundary but does not impact the area within the DCO Site Boundary. However, there is a residual risk of breaching of the tidal defences, where depths of up to 1.16 m or 1.54 m for Option 1 and 2 respectively (0.1% AEP present day flood) could be experienced. Given that this is a residual risk, it is considered that the likelihood of it occurring is very low and can be managed through standard mitigation measures as described above (Section 11.6). Therefore, it can be concluded that within Section 5, including the Theddlethorpe Facility the magnitude of impact of the tidal flood risk is negligible, and the significance of impact is negligible and therefore not significant.

Table 11-23: Assessment of Potential Impacts: Construction Phase

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
Section 1				
Skitter Beck / East Halton Beck Water Body (GB104029067655)	Surface Water: Very High	<u>Northern Construction Compound (surface water impact)</u> Works that are to take place in the Skitter Beck / Easy Halton Beck Water Body include the Northern Construction Compound. This does not directly cross the waterbody or its tributaries but is located within its catchment. There are field drains bordering the entire northern compound which could be potential flow pathways to the waterbody. The construction compound is estimated to be in use for 12 months during the construction works, and with the associated embedded mitigation (Section 11.6), the magnitude of impact of contaminated site run-off and the risk of chemical spillages is considered to be Negligible. Therefore, the significance of effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
Internal Drainage Board watercourses (including Harborough Marsh Drain)	Surface Water: Medium	<u>Pipeline – Haul roads and laydown areas (surface water impact)</u> In section 1, there are six IDB drains which may be impacted by the haul roads and the laydown area across the working width of the Proposed Development. Furthermore, unnamed drains (assessed below) which are being impacted by haul roads and laydown areas will likely drain to these IDB watercourses and are therefore potential flow pathways to them. The haul roads and laydown areas are considered to take up to 10 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
	Surface Water: Medium	<u>Immingham Facility (surface water impact)</u> The flow pathways associated with the Immingham Facility are South Killingholme Drain Branch 1 which lies to northern boundary of the facility South Killingholme Drain which lies to the west of the facilities boundary. The construction works are considered to take up to 32 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated run-off and risk of chemical spillages, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Surface Water: Medium	<u>Flumed crossings (surface water impact)</u> In section 1, there are three flumed crossings of IDB drains. The potential flow pathways are Habrough Marsh Drain Branch 4 (which is flumed twice) and Habrough Marsh Drain Branch 3. Habrough Marsh Drain Branch 2 may also be impacted as it is connected downstream to Branch 3. The culverted areas are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Hydromorphology: Low	<u>Flumed crossings (hydromorphological impact)</u> In section 1, there are three flumed crossings of IDB drains. The potential flow pathways are Habrough Marsh Drain Branch 4 (which is flumed twice) and Habrough Marsh Drain Branch 3. Habrough Marsh Drain Branch 2 may also be impacted as it is connected downstream to Branch 3. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of potential scour and discontinuity, is	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.		
	Surface Water: Medium	<u>Pipeline – Open cut crossing (surface water impact)</u> In section 1, there are two open-cut crossings of the pipeline on IDB watercourses (Habrough Marsh Drain Branch 4 (along two different points) and Habrough Marsh Drain Branch 3). The potential downstream receptors also include Habrough Marsh Drain Branch 2. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and decreased hydromorphological function, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Hydromorphology: Low	<u>Pipeline – Open cut crossing (hydromorphological impact)</u> In section 1, there are two open-cut crossings of the pipeline on IDB watercourses (Habrough Marsh Drain Branch 4 (along two different points) and Habrough Marsh Drain Branch 3). The potential downstream receptors also include Habrough Marsh Drain Branch 2. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of decreased hydromorphological function, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
Other permanent surface water features	Surface Water: Medium	<u>Immingham Facility (surface water impact)</u> While no mapped surface water drains (other than IDB watercourses) appear to connect to the Immingham Facility, it is likely that there are numerous unnamed ditches, drains and small ponds across the study area, which although not directly affected	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		by the proposed construction works could still be impacted by uncontrolled site runoff laden with fine sediment or accidental spillages from the facility or other construction chemicals if not mitigated. The construction works of the Immingham Facility are considered to take up to 32 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.		
	Surface Water: Medium	<u>Pipeline – Haul roads and laydown areas (surface water impact)</u> In section 1, there are 8 unnamed ditches and drains across the study area which may be impacted by the haul roads and the laydown area across the working width of the Proposed Development. Predominantly these are draining into IDB watercourses. The haul roads and laydown areas are considered to take up to 10 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Surface Water: Medium	<u>Flumed crossings (surface water impact)</u> In section 1, there are three flumed crossings of other permanent watercourses and drains. Predominantly these are draining into IDB watercourses. The culverted areas are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
	Hydromorphology: Medium	<u>Flumed crossings (hydromorphological impact)</u> In section 1, there are three flumed crossings of other permanent watercourses and drains. Predominantly these are draining into IDB watercourses. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of potential scour and discontinuity, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Surface Water: Medium	<u>Pipeline – Open cut crossing (surface water impact)</u> In section 1, there are two open-cut crossings of the pipeline on un-named drains and watercourses. Typically, these all drain into IDB watercourses. The open-cut crossings are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Hydromorphology: Low	<u>Pipeline – Open cut crossing (hydromorphological impact)</u> In section 1, there are two open-cut crossings of the pipeline on un-named drains and watercourses. Typically, these all drain into IDB watercourses. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of decreased hydromorphological function, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Surface Water: Medium	<u>Pipeline – Auger bore (surface water impact)</u>	Negligible	Negligible (Not significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		In section 1, there are three auger bore crossings of the pipeline on un-named drains and surface water features. Typically, these all drain into IDB watercourses. The auger bore crossings are considered to take up to 8 weeks for each individual waterbody and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated and sediment-laden run-off and low flows due to water ingress from excavation pits is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.		
Immingham Industrial Area	Flood risk: Medium	Section 1 of the DCO Site Boundary cross the tidal extent of Flood Zones 2 and 3. The main risk to the Immingham Industrial Area is from the increase in permeable area from the Immingham Facility which may increase the rate and volume of surface water runoff to the industrial area. Furthermore, during the construction phase there is a risk of displacing floodwater via the storage of materials/plant in the floodplain. With the implementation of standard construction methods and mitigation measures described in Section 11.6 the risk from flooding can be effectively managed. As such, the magnitude of flooding from these sources during construction is considered to be Negligible, therefore the Significance of effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not Significant)
Section 2				
North Beck Drain (GB104029067575)	Surface Water: Very high	<u>Pipeline – Haul roads and laydown area (surface water impact)</u> There is one laydown area located approximately 150m away from the waterbody. There are also haul roads associated with the working width of the pipeline. The flow pathways to this waterbody include an un-named drain (crossed and assessed below) which may lead to pollutants and sediments propagating downstream. However, the land between the laydown area and the waterbody is	Low	Moderate adverse (Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		grassed which will provide a buffer and filtration to sediments and spillages. The haul roads and laydown areas are considered to take up to 10 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and chemical spillages is considered to be Low, therefore taking into account the very high importance due to being a chalk stream, the significance of the effect is Moderate adverse and therefore Significant.		
	Surface Water: Very high	<u>Pipeline – Bailey bridge (surface water impact)</u> This waterbody is being crossed by a bailey bridge for vehicle access. Location of the bailey bridge is not currently known; however, this will be perpendicular to the flows and set away from the banks to reduce sediment inputs to the chalk stream. Good practice of sediment management associated with the raised soil platforms will reduce the impacts associated with the bridges. The HDD crossings (and therefore the bailey bridge) are considered to take up to 8 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated and sediment-laden run-off is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
	Surface Water: Very high	<u>Pipeline – HDD (surface water impact)</u> This waterbody is being crossed by HDD techniques, alongside the two drains upstream and downstream of the crossings. The potential flow pathways include these two drains. HDD crossings are considered to take up to 8 weeks for each individual waterbody and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated and sediment-laden run-off and impacts to low flows due to dewatering	Negligible	Negligible (Not significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		of excavation pits is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.		
	Surface Water: Very high	<u>Pipeline – Flumed Crossings (surface water impact)</u> North Beck Drain is not directly flumed but a drain downstream of the crossing of North Beck Drain is being flumed and is therefore a potential flow pathway. The increased sediment laden-runoff (particularly from flume removal) may impact the chalk stream through propagation. The culverted areas are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off is considered to be Low, therefore the significance of the effect is Moderate adverse and therefore Significant.	Low	Moderate adverse (Significant)
Mawnbridge Drain (GB104029067540)	Surface Water: High	<u>Pipeline – Haul roads and laydown area (surface water impact)</u> There are no laydown areas located in close proximity to this waterbody. There are haul roads associated with the working width of the pipeline. Although the waterbody is not directly crossed, the catchment is crossed by the pipeline. Therefore, the flow pathways to this waterbody include un-named drains and ditches such as the drain to the north of Hunger Hill Wood and the field drains associated with the farmland within the zone of influence, which may lead to pollutants and sediments propagating downstream to the waterbody. Due to the distance that the pollutants would have to propagate downstream, sediments and pollutants would be diluted before reaching the waterbody which is further mitigated by the embedded mitigation (Section 11.6), therefore the magnitude of impacts is considered to be Negligible. Therefore, the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
Internal Drainage Board water features (including Old Fleet Drain)	Surface Water: Medium	<u>Pipeline – Haul roads and laydown areas (surface water impact)</u> In section 2, there are 2 IDB drains – North Beck Drain and Old Fleet Drain. North Beck Drain has been assessed above for haul roads and laydown areas. The potential flow pathways to the waterbody includes Wells Road which the drain borders and the haul road crosses. There are no laydown areas in proximity to Old Fleet Drain. The construction works are considered to take up to 10 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated run-off and risk of fuel and chemical spillages, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Surface Water: Medium	<u>Flumed crossings (surface water impact)</u> In section 2, there Old Fleet Drain is flumed and a drain that leads to North Beck Drain is also flumed (assessed above). The potential flow pathway to Old Fleet Drain includes Wells Road. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden runoff is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Hydromorphology: Low	<u>Flumed crossings (hydromorphological impact)</u> In section 2, there Old Fleet Drain is flumed and a drain that leads to North Beck Drain is also flumed (assessed above). The potential flow pathway to Old Fleet Drain includes Wells Road. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of potential scour and discontinuity, is	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.		
	Surface Water: Medium	<u>Pipeline – Auger bore (surface water impact)</u> There is one auger bore crossings of the pipeline on Old Fleet Drain. The auger bore crossings are considered to take up to 8 weeks for each individual waterbody and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated and sediment-laden run-off and impacts on low flows due to dewatering of excavation pits is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not Significant)
Other permanent water features	Surface Water: Medium	<u>Pipeline – Haul roads and laydown areas (surface water impact)</u> There are numerous unnamed ditches, drains and small ponds across the study area, which are directly and not directly affected by the haul roads and laydown areas works could still be impacted by uncontrolled site runoff laden with fine sediment or accidental spillages of chemicals and fuels. The construction works are considered to take up to 10 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated run-off and risk of fuel and chemical spillages, is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not Significant)
	Surface Water: Medium	<u>Flumed crossings (surface water impact)</u> There are multiple flumed crossings of watercourses within section 2 on permanent water features. These predominately lie within farm and agricultural land. It is worth nothing that these are potential flow pathways to numerous drains and ditches downstream of these crossings, however with the associated embedded mitigation, the impacts of these will be reduced.	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden runoff chemical spillages, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.		
	Hydromorphology: Low	<u>Flumed crossings (hydromorphological impact)</u> There are multiple flumed crossings of watercourses within section 2 on permanent water features. These predominately lie within farm and agricultural land. It is worth nothing that these are potential flow pathways to numerous drains and ditches downstream of these crossings, however with the associated embedded mitigation, the impacts of these will be reduced. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of potential scour and discontinuity, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Surface Water: Medium	<u>Pipeline – Open cut crossing (surface water impact)</u> In section 2, there are multiple open-cut crossings of the pipeline on un-named drains and watercourses. Typically, these are field drains. The open-cut crossings are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Hydromorphology: Low	<u>Pipeline – Open cut crossing (hydromorphological impact)</u> In section 2, there are multiple open-cut crossings of the pipeline on un-named drains and watercourses. Typically, these are field drains.	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of decreased hydromorphological function, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.		
	Surface Water: Medium	<u>Pipeline – Auger bore and HDD (surface water impact)</u> In section 2, there are 6 auger bore and 2 HDD crossings of the pipeline on un-named drains and surface water features. The crossings are considered to take up to 8 weeks for each individual waterbody and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated and sediment-laden run-off and impacts to low flows due to dewatering of excavation pits is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not Significant)
	Surface Water: Medium	<u>Washingdales Lane Block Valve Station (surface water impact)</u> The Washingdales Lane Block Valve Station is not located near any WFD, IDB or main watercourses. From mapping it appears that there are no field or land drains that cross the area where the Block Valve Station is located. There is a potential flow pathway down Washingdales Lane which lies on a hill towards a road drain. However, the sides of the road towards to field drain are grassed and lined with hedgerows which will dilute the potential impacts of sediment-laden runoff and chemical spillages alongside the embedded mitigation. The construction of the block valve station is considered to take up to 32 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated and sediment-laden run-off is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
Section 3				
Laceby Beck / River Freshney (to N Sea) (GB104029067530)	Surface Water: Very high	<u>Central Construction Compound (surface water impact)</u> The Central Construction Compound. This does not directly cross the waterbody or its tributaries but is located within its catchment, approximately 150m away from its source. The construction compound is estimated to be in use for 12 months during the construction works, and with the associated embedded mitigation (Section 11.6), the magnitude of impact of contaminated site run-off and the risk of chemical spillages is considered to be Negligible. Therefore, the significance of effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
	Surface Water: Very high	<u>Pipeline – Haul roads and laydown area (surface water impact)</u> There are no laydown areas near the waterbody. There are haul roads associated with the working width of the pipeline, however since the waterbody is being crossed by a bailey bridge (assessed below) the haul roads will likely be set back from the watercourse which will reduce the risk of sediment inputs. The flow pathways to this waterbody include an un-named drain (crossed and assessed below) which may lead to pollutants and sediments propagating downstream. However, the land between the laydown area and the waterbody is grassed which will provide a buffer and filtration to sediments and spillages. The haul roads and laydown areas are considered to take up to 10 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and chemical spillages is considered to be Negligible, therefore the significance of the effect is and therefore Significant.	Negligible	Negligible (Not significant)
	Surface Water: Very High	<u>Pipeline – Auger bore (surface water impact)</u> This waterbody is being crossed by auger bore techniques.	Negligible	Negligible (Not significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		The auger bore crossings are considered to take up to 8 weeks for each individual waterbody and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and impacts to low flows due to dewatering of excavation pits is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.		
	Surface Water: Very High	<u>Pipeline – Bailey bridge (surface water impact)</u> This waterbody is being crossed by a bailey bridge for vehicle access. Location of the bailey bridge is not currently known; however, this will be perpendicular to the flows and set away from the banks to reduce sediment inputs to the chalk stream. Good practice of sediment management associated with the raised soil platforms will reduce the impacts associated with the bridges. The auger bore crossings (and therefore the bailey bridge) are considered to take up to 8 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated and sediment-laden run-off is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
Waithe Beck lower (to Tetney Lock) (GB104029062100)	Surface Water: Very high	<u>Pipeline – Haul roads and laydown area (surface water impact)</u> There are no laydown areas near the waterbody. There are haul roads associated with the working width of the pipeline, however this is being crossed by auger bore and access through a bailey bridge, therefore haul roads will be set back from the watercourse with a buffer of 10m. There are no direct flow pathways to this waterbody. Furthermore, the land between the haul road and the waterbody is grassed and wooded which will provide a buffer and filtration to sediments and spillages. The haul roads and laydown areas are considered to take up to 10 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and	Negligible	Negligible (Not significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		chemical spillages is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not significant.		
	Surface Water: Very high	<u>Pipeline – Auger bore (surface water impact)</u> This waterbody is being crossed by auger bore techniques. The auger bore crossings are considered to take up to 8 weeks for each individual waterbody and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and impacts to low flows due to dewatering of excavation pits is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
	Surface Water: Very high	<u>Pipeline – Bailey bridge</u> This waterbody is being crossed by a bailey bridge for vehicle access. The location of the bailey bridge will be to the east of the crossing, away from the wooded area where the waterbody is less sinuous. This will be perpendicular to the flows and set away from the banks to reduce sediment inputs to the chalk stream. Good practice of sediment management associated with the raised soil platforms The auger bore crossings (and therefore the bailey bridge) are considered to take up to 8 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated and sediment-laden run-off is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
	Surface Water: Very High	<u>Pipeline – Open cut (surface water impact)</u> Waithe Beck is not directly crossed by open-cut techniques but a drain that upstream of the crossing of Waithe Beck is being open cut and flumed and is therefore a potential flow pathway. The increased sediment-laden runoff may impact the chalk stream through propagation.	Low	Moderate (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden runoff and chemical spillages, is considered to be Minor adverse, therefore the significance of the effect is Moderate and therefore Significant.		
	Surface Water: Very High	<u>Pipeline – Flumed crossings</u> Waithe Beck is not directly flumed but a drain that upstream of the crossing of Waithe Beck is being open cut and flumed and is therefore a potential flow pathway. The increased sediment-laden runoff may impact the chalk stream through propagation. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden runoff, is considered to be Minor adverse, therefore the significance of the effect is Moderate and therefore Significant.	Low	Moderate (Not Significant)
Land Dike Drain to Louth Canal (West) (GB104029062162)	Surface Water: High	<u>Pipeline – Haul roads and laydown area</u> The Land Dike Drain waterbody is not directly crossed by the pipeline, however several unnamed drains and ditches that leads to Land Dike Drain, do and are therefore potential flow pathways. These will be assessed under 'Other permanent water features' also for impacts to them directly. There is a laydown area to the northern border of the catchment, however between the laydown area and the nearest drain is buffered by 100m of grassed farmland which will filtrate sediments and pollutants. There are haul roads associated with the working width of the pipeline. Although the waterbody is not directly crossed, the catchment is crossed by the pipeline. Due to the distance that the pollutants would have to propagate downstream, sediments and pollutants would be diluted before reaching the waterbody which is further mitigated by the embedded mitigation (Section 11.6),	Negligible	Negligible (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		therefore the magnitude of impacts is considered to be Negligible. Therefore, the significance of the effect is Negligible and therefore Not Significant.		
	Surface Water: High	<u>Pipeline – Open cut crossings (surface water impact)</u> Land Dike Drain is not directly crossed by open-cut techniques, but 8 unnamed drains and watercourses that are upstream of the waterbody are and are therefore potential flow pathways. The increased sediment-laden runoff (particularly from flume removal) may impact the water feature through propagation. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden runoff and chemical spillages is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Significant.	Low	Minor Adverse (Not Significant)
	Surface Water: High	<u>Pipeline – Flumed crossings (surface water impact)</u> Land Dike Drain is not directly flumed but 8 unnamed drains and watercourses that are upstream of the waterbody are being flumed and are therefore potential flow pathways. The increased sediment-laden runoff (particularly from flume removal) may impact the water feature through propagation. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden runoff and chemical spillages is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
Other permanent water features	Surface Water: Medium	<u>Pipeline – Haul roads and laydown areas (surface water impact)</u> There are numerous unnamed ditches, drains and small ponds across the study area, which are directly and not directly affected by the haul roads and laydown areas works could still be impacted	Negligible	Negligible (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		by uncontrolled site runoff laden with fine sediment or accidental spillages of chemicals and fuels. The construction works are considered to take up to 10 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated run-off and risk of fuel and chemical spillages, is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.		
	Surface Water: Medium	<u>Flumed crossings (surface water impact)</u> There are numerous flumed crossings of watercourses within section 3 on other permanent water features. These predominately lie within farm and agricultural land. It is worth nothing that these are potential flow pathways to numerous drains and ditches downstream of these crossings, however with the associated embedded mitigation, the impacts of these will be reduced. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden runoff and chemical spillages is considered to be Minor adverse, therefore the significance of the effect is Minor and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Hydromorphology: Low	<u>Flumed crossings (hydromorphological impact)</u> There are numerous flumed crossings of watercourses within section 3 on other permanent water features. These predominately lie within farm and agricultural land. It is worth nothing that these are potential flow pathways to numerous drains and ditches downstream of these crossings, however with the associated embedded mitigation, the impacts of these will be reduced. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of potential scour and discontinuity, is	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.		
	Surface Water: Medium	<u>Pipeline – Open cut crossing (surface water impact)</u> In section 3, there are numerous open-cut crossings of the pipeline on un-named drains and watercourses. Typically, these are field drains. The open-cut crossings are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Hydromorphology: Low	<u>Pipeline – Open cut crossing (hydromorphological impact)</u> In section 3, there are numerous open-cut crossings of the pipeline on un-named drains and watercourses. Typically, these are field drains. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of decreased hydromorphological function, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Surface Water: Medium	<u>Pipeline – Auger bore (surface water impact)</u> In section 3, there are four auger bore of the pipeline on un-named drains and surface water features. The crossings are considered to take up to 8 weeks for each individual waterbody and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and impacts to low flows due to dewatering of excavation pits is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
	Surface Water: Medium	<u>Thoroughfare Block Valve Station (surface water impact)</u> The Thoroughfare Block Valve Station is not located near any WFD, IDB or main watercourses. There are field drains to the north and south of working area which a potential flow pathway. However, the sides of the road (Thoroughfare) towards to field drain are grassed and lined with hedgerows which will dilute the potential impacts of sediment-laden runoff and chemical spillages alongside the embedded mitigation. The construction of the block valve station is considered to take up to 32 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated and sediment-laden run-off is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
Section 4				
Poulton Drain (trib of Louth Canal) (GB104029062010)	Surface Water: High	<u>Pipeline – Haul roads and laydown area (surface water impact)</u> There are no laydown areas near the waterbody. There are haul roads associated with the working width of the pipeline, however this is being crossed by auger bore and access through a bailey bridge, therefore haul roads will be set back from the watercourse. There are no direct flow pathways to this waterbody. Furthermore, the land between the haul road and the waterbody is grassed which will provide a buffer and filtration to sediments and spillages. The haul roads and laydown areas are considered to take up to 10 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and chemical spillages is considered to be Negligible, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Negligible	Negligible (Not significant)
	Surface Water: High	<u>Pipeline – Auger bore (surface water impact)</u> This waterbody is being crossed by auger bore techniques.	Negligible	Negligible (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		The auger bore crossings are considered to take up to 8 weeks for each individual waterbody and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and impacts to low flows due to dewatering of excavation pits is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.		
	Surface Water: High	<u>Pipeline – Bailey bridge (surface water impact)</u> This waterbody is being crossed by a bailey bridge for vehicle access. The location of the bailey bridge will be to the east of the crossing, away from the wooded area where the waterbody is less sinuous. This will be perpendicular to the flows and set away from the banks to reduce sediment inputs. Good practice of sediment management associated with the raised soil platforms will reduce the impacts associated with the bridges. The auger bore crossings (and therefore the bailey bridge) are considered to take up to 8 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated and sediment-laden run-off is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not Significant)
Black Dyke (trib of Louth Canal) (GB104029062000)	Surface Water: High	<u>Pipeline – Haul roads and laydown area (surface water impact)</u> There is one laydown area to the south of Little Grimsby Lane in which a field drain discharges into the Black Dyke Waterbody that may have an effect on the waterbody. There are haul roads associated with the working width of the pipeline, however this is being crossed by auger bore and access through a bailey bridge, therefore haul roads will be set back from the watercourse. There are no direct flow pathways to this waterbody. Furthermore, the land between the haul road and the waterbody is grassed which will provide a buffer and filtration to sediments and spillages.	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		The haul roads and laydown areas are considered to take up to 10 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and chemical spillages is considered to be Low. This is considered to be a precautionary magnitude of impact (rather than negligible) as there are no direct flow pathways. Therefore the significance of the effect is Minor adverse and therefore Not Significant.		
	Surface Water: High	<u>Pipeline – Auger bore (surface water impact)</u> This waterbody is being crossed by auger bore techniques. The field drain near the laydown area near Little Grimsby Lane is also being crossed by auger bore techniques (flow pathway to Black Dyke). The auger bore crossings are considered to take up to 8 weeks for each individual waterbody and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and low flows due to water ingress from excavation pits is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not Significant)
	Surface Water: High	<u>Pipeline – Open-cut (surface water impact)</u> Black Dyke Drain is not directly crossed by open-cut techniques however the field drain that drains into Black Dyke Drain is, which is a potential flow pathway. The increased sediment-laden runoff may impact the waterbody through propagation. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and chemical spillages, is considered to be Low. This is considered to be a precautionary magnitude (rather than negligible). Therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
	Surface Water: High	<u>Pipeline – Flumed access (surface water impact)</u> Black Dyke Drain is not directly flumed however the field drain that drains into Black Dyke Drain is which is a potential flow pathway. The increased sediment-laden runoff (particularly from flume removal) may impact the waterbody through propagation. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and chemical spillages, is considered to be Low. This is considered to be a precautionary magnitude (rather than negligible). Therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
Louth Canal (GB104029061990)	Surface Water: High	<u>Pipeline – Haul roads and laydown area (surface water impact)</u> There is one laydown area to the south of Louth Road, however there do not seem to be any direct potential flow pathways to Louth Canal as the field where the works are drain towards Louth Road rather than Louth Canal. There is a field drain that leads to Alvingham Mill Stream which eventually drains into Louth Canal at TF 36917 91489. This is approximately 1.8km downstream which is considered to be out of the zone of influence and therefore the Louth Canal is not likely to be impacted by the laydown area. There are haul roads associated with the working width of the pipeline which has the potential to impact the canal. The land between the haul road and the waterbody is grassed which will provide a buffer and filtration to sediments and spillages. The haul roads and laydown areas are considered to take up to 10 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and chemical spillages is considered to be Low. This is considered to be a precautionary magnitude (rather than negligible) as there are	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		no direct flow pathways. Therefore the significance of the effect is Minor adverse and therefore Not Significant.		
	Surface Water: High	<u>Pipeline – HDD (surface water impact)</u> This waterbody is being crossed by HDD techniques. The HDD crossings are considered to take up to 8 weeks for each individual waterbody and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and impacts to low flows due to dewatering of excavation pits is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
South Dike and Grayfleet Drain (GB105029061680)	Surface Water: High	<u>Pipeline – Haul roads and laydown area (surface water impact)</u> There are no laydown areas near the waterbody. There are haul roads associated with the working width of the pipeline, however this is being crossed by auger bore and access through a bailey bridge, therefore haul roads will be set back from the watercourse. There are no direct flow pathways to this waterbody. Furthermore, the land between the haul road and the waterbody is grassed which will provide a buffer and filtration to sediments and spillages. The haul roads and laydown areas are considered to take up to 10 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and chemical spillages is considered to be Low. This is considered to be a precautionary magnitude (rather than negligible) as there are no direct flow pathways to the waterbody. Therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Surface Water: High	<u>Pipeline – HDD (surface water impact)</u> This waterbody is being crossed by HDD techniques. The HDD crossings are considered to take up to 8 weeks for each individual waterbody and with the associated embedded mitigation	Negligible	Negligible (Not significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		(Section 11.6) the magnitude of impact of sediment-laden run-off and impacts to low flows due to dewatering of excavation pits is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.		
	Surface Water: High	<u>Pipeline – Bailey bridge (surface water impact)</u> This waterbody is being crossed by a bailey bridge for vehicle access. The location of the bailey bridge will be to the east of the crossing between Pick Hill Lane. This will be perpendicular to the flows and set away from the banks to reduce sediment inputs to the chalk stream. Good practice of sediment management associated with the raised soil platforms will reduce the impacts associated with the bridges. The auger bore crossings (and therefore the bailey bridge) are considered to take up to 8 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated and sediment-laden run-off is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
Internal Drainage Board water features	Surface water: Medium	The IDB water features within section 4 directly crossed include, Harrowsea Drain, Middle Sykes Road Sewer and Manby Middlegate Drain. Manby Middlegate Drain is a flow pathway to Sykes Drain. The IDB water features that are not directly crossed are Upper South Drain, Old North Drain, Fleet Drain and Sykes Drain. The flow pathways to Upper South Drain is a connecting field drain off of Louth Road and the potential flow pathway to Fleet Drain is via Sykes Drain. There does not appear to be a flow pathway to Old North Drain. <u>Pipeline – Haul roads and laydown areas (surface water impact)</u> In section 4, there are four laydown areas which have the potential to impact Upper South Drain, Harrowsea Drain and Manby Middlegate Drain.	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		The construction works are considered to take up to 10 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated run-off and risk of fuel and chemical spillages, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.		
	Surface water: Medium	<u>Flumed crossings (surface water impact)</u> In section 4, there are three flumed crossings of IDB drains. The drains being directly flumed are Harrowsea Drain, Middle Sykes Road Sewer, Manby Middlegate Drain. Sykes drain has the potential be impacted by the propagation of sediments downstream via Manby Middlegate Drain. There are also two 'other permanent water features' that drain to Harrowsea Drain and Manby Middlegate Drain that are also being flumed in which sediments may propagate downstream into. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact sediment-laden runoff and chemical spillages, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Hydromorphology: Low	<u>Flumed crossings (hydromorphological impact)</u> In section 4, there are three flumed crossings of IDB drains. The drains being directly flumed are Harrowsea Drain, Middle Sykes Road Sewer, Manby Middlegate Drain. Sykes drain has the potential be impacted by the propagation of sediments downstream via Manby Middlegate Drain. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of potential scour and discontinuity, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
	Surface water: Medium	<u>Pipeline – Open cut crossing (surface water impact)</u> In section 4, there are two open-cut crossings of the pipeline on IDB water features on Harrowsea Drain and Middle Sykes Road Sewer. There are also two 'other permanent water features' that drain to Harrowsea Drain and Manby Middlegate Drain that are also being flumed in which sediments may propagate downstream into. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Hydromorphology: Low	<u>Pipeline – Open cut crossing (hydromorphological impact)</u> In section 4, there are two open-cut crossings of the pipeline on IDB water features on Harrowsea Drain and Middle Sykes Road Sewer. There are also two 'other permanent water features' that drain to Harrowsea Drain and Manby Middlegate Drain that are also being flumed in which sediments may propagate downstream into. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of decreased hydromorphological function, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Surface water: Medium	<u>Louth Road Block Valve Station (surface water impact)</u> The Louth Road Block Valve Station is the other side of Louth Road from the laydown area. There is a field drain south of working area which a potential flow pathway to Upper South Drain. The construction of the block valve station is considered to take up to 32 weeks and with the associated embedded mitigation (Section	Negligible	Negligible (Not significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		11.6) the magnitude of impact of contaminated and sediment-laden run-off and low flows is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.		
Other permanent water features	Surface water: Medium	<u>Pipeline – Haul roads and laydown areas (surface water impact)</u> There are numerous unnamed ditches, drains and small ponds across the study area, which are directly and not directly affected by the haul roads and laydown areas works could still be impacted by uncontrolled site runoff laden with fine sediment or accidental spillages of chemicals and fuels. The construction works are considered to take up to 10 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated run-off and risk of fuel and chemical spillages, is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
	Surface water: Medium	<u>Flumed crossing (surface water impact)</u> There are numerous flumed crossings of watercourses within section 4 on other permanent water features. These predominately lie within farm and agricultural land. It is worth nothing that these are potential flow pathways to numerous drains and ditches downstream of these crossings, however with the associated embedded mitigation, the impacts of these will be reduced. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden runoff, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Hydromorphology: Low	<u>Flumed crossing (hydromorphological impact)</u> There are numerous flumed crossings of watercourses within section 4 on other permanent water features. These predominately lie within farm and agricultural land. It is worth nothing that these	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		are potential flow pathways to numerous drains and ditches downstream of these crossings, however with the associated embedded mitigation, the impacts of these will be reduced. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of potential scour and discontinuity, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.		
	Surface water: Medium	<u>Pipeline – Open cut crossing (surface water impact)</u> In section 4, there are 9 open-cut crossings of the pipeline on un-named drains and watercourses. Typically, these are field drains. The open-cut crossings are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Hydromorphology: Low	<u>Pipeline – Open cut crossing (hydromorphological impact)</u> In section 4, there are 9 open-cut crossings of the pipeline on un-named drains and watercourses. Typically, these are field drains. The open-cut crossings are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of potential scour and discontinuity is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Surface water: Medium	<u>Pipeline – Auger bore and HDD (surface water impact)</u> In section 4, there are 7 auger bore and 2 HDD crossings of the pipeline on un-named drains and surface water features. The crossings are considered to take up to 8 weeks for each individual waterbody and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off	Negligible	Negligible (Not significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		and low flows due to water ingress from excavation pits is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.		
	Surface water: Medium	<u>Louth Road Block Valve Station (surface water impact)</u> The Louth Road Block Valve Station is the other side of Louth Road from the laydown area. There is a field drain south of working area which (the flow pathway to Upper South Drain) which may be impacted The construction of the block valve station is considered to take up to 32 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated and sediment-laden run-off is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
Potable water supply: Covenham Reservoir Waterbody (Section 4 and 5)	Very High	Covenham Reservoir is a downstream receptor to Louth Canal and is at risk of receiving suspended fine sediments and chemical spillages from the watercourses that drain into it. The activities that carry this risk in particular are the open-cut crossings, flumed crossings (insertion and removal) and the haul roads. The embedded mitigation associated with Covenham Reservoir states that surface water and groundwater discharges should not be made upstream of the abstraction points of Louth Canal, Great Eau and Long Eau to Covenham Reservoir. With the implementation of standard construction methods and mitigation measures described in Section 11.6 the risk from flooding can be effectively managed. As such, the magnitude of flooding from these sources during construction is considered to be Negligible, therefore the Significance of effect is Negligible and therefore Not Significant	Negligible	Negligible (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
Section 5				
Long Eau (GB105029061670)	Surface water: High	<u>Pipeline – Haul roads and laydown area (surface water impact)</u> There is one laydown area to the south of the Long Eau crossing, however, there do not seem to be any direct potential flow pathways to waterbody as the field where the works are drain towards the field drain towards the north of the field which does not appear to discharge into the Long Eau waterbody. There are haul roads associated with the working width of the pipeline which has the potential to impact the waterbody. The land between the haul road and the waterbody is grassed which will provide a buffer and filtration to sediments and spillages. The haul roads and laydown areas are considered to take up to 12 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and chemical spillages is considered to be Low. This is considered to be a precautionary magnitude (rather than negligible) as there are no direct flow pathways to the waterbody. Therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Surface water: High	<u>Pipeline – HDD (surface water impact)</u> This waterbody is being crossed by HDD techniques. The HDD crossings are considered to take up to 8 weeks for each individual waterbody and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and impacts to low flows due to dewatering of excavation pits is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
	Surface water: High	<u>Pipeline – Haul roads and laydown area (surface water impact)</u> There are no laydown areas impacting the Great Eau waterbody.	Negligible	Negligible (Not significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
Great Eau (d/s of South Thoresby) (GB105029061660)		There are haul roads associated with the working width of the pipeline which has the potential to impact the waterbody. However, the waterbody and the drains either side of the waterbody are being crossed by HDD techniques which means the haul roads to the launch and receiver pits will be set back at least 80m either side of the Great Eau. Furthermore, the land between the drains the waterbody is grassed which will provide a buffer and filtration to sediments and spillages. The haul roads and laydown areas are considered to take up to 12 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and chemical spillages is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.		
	Surface water: High	<u>Pipeline – HDD (surface water impact)</u> This waterbody is being crossed by HDD techniques. The HDD crossings are considered to take up to 8 weeks for each individual waterbody and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and impacts to low flows due to dewatering of excavation pits is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
Internal Drainage Board water features	Surface water: Medium	The IDB water features within section 5 directly crossed includes Manby Middle Drain (which is a flow pathway to Sykes Drain), Little Mardyke (also a flow pathway to Sykes Drain), Head Dyke, Mablethorpe Middle Cut, Two Mile Bank Drain, Gayton North Fen Drain (which is a flow pathway to New Gayton Engine Drain), New Gayton Engine Drain, Old Engine Drain, Grove Road Drain (which is a flow pathway to The Cut), and Mablethorpe Lower Cut (which is a flow pathway to Mablethorpe Urban Cut) <u>Pipeline – Haul roads and laydown areas (surface water impact)</u>	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		In section 5, there are four laydown areas which have the potential to impact Manby Middle Drain, Sykes Drain, Rotten Row Drain, Mill and Harps Drain and Mablethorpe Lower Cut. There are haul roads associated with the working width of the pipeline and therefore all the crossed receptors and their downstream connections have the potential to be impacted. The construction works are considered to take up to 12 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated run-off and risk of fuel and chemical spillages, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.		
	Surface water: Low	<u>Southern Construction Compound (surface water impact)</u> The Southern Construction Compound is located at the car park (hardstanding) on the former TGT site. Unlike the Northern and Central Compounds, the Southern Compound will have no topsoil removed which removes the impact of sediment run-off from topsoil removal and storage. However, the risk of dust mobilisation from vehicle movement and chemical spillages remains. The compound is bordered by Mablethorpe Lower Cut which is considered to be the main receptor, and is a potential flow pathway to other IDB drains including Mablethorpe Urban Cut. The construction compound is estimated to be in use for 12 months during the construction works, and with the associated embedded mitigation (Section 11.6), the magnitude of impact of contaminated site run-off and the risk of chemical spillages is considered to be Negligible. Therefore, the significance of effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
	Surface water: Low	<u>Flumed crossings (surface water impact)</u> In section 5, there are 10 IDB watercourses that are directly fumed and multiple unnamed drains that drain into IDB watercourses	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		(potential flow pathways) that are flumed. No works are proposed in Section 5 over the winter period, when flows are at their highest. Although higher flows have a capability of diluting sediments and chemicals in a water feature, flooding risk is increased, particularly with additional material entering the watercourses. Therefore, by no works being undertaken in the winter, flood risk is reduced. Alongside the embedded mitigation to reduce sediments and chemical spillages as well as scour the magnitude of impacts considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.		
	Hydromorphology: Low	<u>Flumed crossings (hydromorphological impact)</u> In section 5, there are 10 IDB watercourses that are directly fumed and multiple unnamed drains that drain into IDB watercourses (potential flow pathways) that are flumed. No works are proposed in Section 5 over the winter period, when flows are at their highest. Alongside the embedded mitigation to reduce the impacts of potential scour and discontinuity the magnitude of impacts considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Surface water: Low	<u>Pipeline – Open cut crossing (surface water impact)</u> In section 5, there are five open-cut crossings of the pipeline on IDB water features on Mablethorpe Middle Cut, Two Mile Bank Drain, Gayton North Fen Drain, New Gayton Engine Drain and Mill and Harps Drain There are also multiple ‘other permanent water features’ that drain IDB watercourses that are potential flow pathways that are also being flumed in which sediments may propagate downstream into. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and decreased	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		hydromorphological function, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.		
	Hydromorphology: Low	<u>Pipeline – Open cut crossing (hydromorphological impact)</u> In section 5, there are five open-cut crossings of the pipeline on IDB water features on Mablethorpe Middle Cut, Two Mile Bank Drain, Gayton North Fen Drain, New Gayton Engine Drain and Mill and Harps Drain The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of potential scour and discontinuity and decreased hydromorphological function, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Surface water: Low	<u>Theddlethorpe Facility Option 1 (surface water impact)</u> Theddlethorpe Facility Option 1 is a new facility at the former Theddlethorpe Gas Terminal (TGT) site. IDB watercourses that have the potential to be impacted are Crook Bank Drain West which lies to the east of the proposed site. The downstream ID receptors of Crook Bank Drain are Mablethorpe Lower Cut and Mablethorpe Urban Cut. The construction works are considered to take up to 32 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated run-off and risk of chemical spillages, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Surface water: Low	<u>Theddlethorpe Facility Option 2 (surface water impact)</u> Theddlethorpe Facility Option 2 is a new facility to the west of the former TGT site, located on arable land directly west of The Cut (an ordinary / IDB watercourse). The sites is bordered by	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		Mablethorpe Lower Cut on its east side and the downstream receptors include Mablethorpe Urban Cut. The construction works are considered to take up to 32 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated run-off and risk of chemical spillages, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.		
Internal Drainage Board watercourses: Mills and Harps Drain & Rotten Row Drain	Surface water: High	<u>Pipeline – Haul roads and laydown areas (surface water impact)</u> In section 5, there is one laydown areas which has the potential to impact Rotten Row Drain and Mill and Harps Drain. There are haul roads associated with the working width of the pipeline and therefore all the crossed receptors and their downstream connections have the potential to be impacted. The construction works are considered to take up to 12 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated run-off and risk of fuel and chemical spillages, is considered to be Low. This is considered to be a precautionary magnitude (rather than negligible). Therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Surface water: High	<u>Flumed crossings (surface water impact)</u> Both Mills and Harps Drain & Rotten Row Drain are to be flumed. No works are proposed in Section 5 over the winter period, when flows are at their highest. Although higher flows have a capability of diluting sediments and chemicals in a water feature, flooding risk is increased, particularly with additional material entering the watercourses. Therefore, by no works being undertaken in the winter, flood risk is reduced. Alongside the embedded mitigation to reduce sediments and chemical spillages as well as scour the magnitude of impacts	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.		
	Surface water: High	<u>Pipeline – Open cut crossing (surface water impact)</u> In section 5, Mill and Harps Drain is to be crossed by open cut techniques. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and decreased hydromorphological function, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Surface water: High	<u>Pipeline - HDD (surface water impact)</u> In section 5, Rotten Row Drain is to be crossed by HDD techniques. The crossings are considered to take up to 8 weeks for each individual waterbody and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and impacts to low flows due to dewatering of excavation pits is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
Other permanent water features	Surface water: Medium	<u>Pipeline – Haul roads and laydown areas (surface water impact)</u> There are numerous unnamed ditches, drains and small ponds across the study area, which are directly and not directly affected by the haul roads and laydown areas works could still be impacted by uncontrolled site runoff laden with fine sediment or accidental spillages of chemicals and fuels. The construction works are considered to take up to 12 months and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated run-off and risk of fuel and	Negligible	Negligible (Not significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		chemical spillages, is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.		
	Surface water: Medium	<u>Flumed crossing (surface water impact)</u> There are numerous flumed crossings of watercourses within section 5 on other permanent water features. These predominately lie within farm and agricultural land. It is worth nothing that these are potential flow pathways to numerous drains and ditches downstream of these crossings, however with the associated embedded mitigation, the impacts of these will be reduced. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden runoff and potential scour and discontinuity, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Hydromorphology: Low	<u>Flumed crossing (hydromorphological impact)</u> There are numerous flumed crossings of watercourses within section 5 on other permanent water features. These predominately lie within farm and agricultural land. The construction works are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden runoff and potential scour and discontinuity, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Surface water: Medium	<u>Pipeline – Open cut crossing (surface water impact)</u> In section 5, there are numerous open-cut crossings of the pipeline on un-named drains and watercourses. Typically, these are field drains.	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		The open-cut crossings are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.		
	Hydromorphology: Low	<u>Pipeline – Open cut crossing (hydromorphological impact)</u> In section 5, there are numerous open-cut crossings of the pipeline on un-named drains and watercourses. Typically, these are field drains. The open-cut crossings are considered to take up to 3 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of decreased hydromorphological function and discontinuity is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.	Low	Minor Adverse (Not Significant)
	Surface water: Medium	<u>Pipeline – Auger bore and HDD (surface water impact)</u> In section 5, there are 8 auger bore and 2 HDD crossings of the pipeline on un-named drains and surface water features. The crossings are considered to take up to 8 weeks for each individual waterbody and with the associated embedded mitigation (Section 11.6) the magnitude of impact of sediment-laden run-off and impacts to low flows due to dewatering of excavation pits is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
	Surface water: Medium	<u>Theddlethorpe Facility Option 2 (surface water impact)</u> There are no flow receptors of ‘other permanent water features’ (other than IDB drains) for Option 1. For Option 2 there is an unnamed drain to the west of the facility which may be a potential receptor. This is also a flow pathway to the IDB drain Mablethorpe Lower Cut.	Low	Minor Adverse (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		The construction works are considered to take up to 32 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated run-off and risk of chemical spillages, is considered to be Low, therefore the significance of the effect is Minor adverse and therefore Not Significant.		
	Surface water: Medium	<u>Dune Isolation Valve (surface water impact)</u> The Dune Isolation Valve is located close to the sand dunes to the east of the existing valve station. It is located next to an un-named drain that provides drainage to the already existing site; therefore this will also have the potential to be impacted through the construction works associated with the new Dune Valve. The construction works are considered to take up to 32 weeks and with the associated embedded mitigation (Section 11.6) the magnitude of impact of contaminated run-off and risk of chemical spillages, is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
Saltfleetby - Theddlethorpe Dunes SAC, NNR and SSSI	Surface water: Very High	<u>Dune Isolation Valve (surface water impact)</u> The Dune Isolation Valve is located close to the sand dunes to the east of the existing valve station. However, the Proposed Development would not directly impact this land, consequently magnitude of impact would be 'Negligible and the potential impact is Negligible and Not Significant.	Negligible	Negligible (Not significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
Potable water supply: Covenham Reservoir Waterbody (Section 4 and 5)	Very High	Covenham Reservoir is a downstream receptor to Louth Canal and is at risk of receiving suspended fine sediments and chemical spillages from the watercourses that drain into it. The activities that carry this risk in particular are the open-cut crossings, flumed crossings (insertion and removal) and the haul roads. The embedded mitigation associated with Covenham Reservoir states that surface water and groundwater discharges should not be made upstream of the abstraction points of Louth Canal, Great Eau and Long Eau to Covenham Reservoir. With the implementation of standard construction methods and mitigation measures described in Section 11.6 the risk from flooding can be effectively managed. As such, the magnitude of flooding from these sources during construction is considered to be Negligible, therefore the Significance of effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not Significant)
All sections				
Ephemeral and/or artificial drains, ditches	Surface water: Low	<u>(Surface water impact)</u> There are numerous ephemeral unnamed ditches, drains and small ponds across the study area, which although not directly affected by the proposed construction works could still be impacted by uncontrolled site runoff laden with fine sediment or accidental spillages from plant or other construction chemicals if not mitigated. However, with the implementation of the mitigation measures set out in Section 11.6, a short term and temporary negligible impact from the risk of accidental chemical spillages and contaminated site runoff is predicted. On low significance watercourses, the magnitude of impact of contaminated and sediment-laden run-off and chemical spillages is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
Humber Estuary (WFD / SAC) (Section 1 – 4)	Surface water: Very High	(Surface water impact) The main watercourses and water features in the study area in section 1 – 4 drain into the Humber Estuary. Therefore, these provide potential flow pathways to the Humber Estuary. All construction work associated with these watercourses have the potential to propagate sediments and spillages downstream, however the magnitude of impact on the Humber is considered to be Negligible due to the distance that the contaminants and pollutants would have to travel. Furthermore, the dilution potential of the Humber estuary is considerably high due to its size. Therefore, the Significance of effect is considered to be Negligible and therefore Not Significant.	Negligible	Negligible (Not Significant)
Lincolnshire Waterbody (coastal WFD) (Section 1 – 5)	Surface water: High-	(Surface water impact) The main watercourses and water features in the study area drain into the Lincolnshire Costal waterbody. Therefore, these provide potential flow pathways to the Lincolnshire Coastal waterbody. All construction work associated with these watercourses have the potential to propagate sediments and spillages downstream, however the magnitude of impact on the waterbody is considered to be Negligible due to the distance that the contaminants and pollutants would have to travel. Furthermore, the dilution potential of the Lincolnshire Coastal waterbody is considerably high due to its size. Therefore, the Significance of effect is considered to be Negligible and therefore Not Significant.	Negligible	Negligible (Not Significant)
Flood risk: agricultural land	Medium	Installation of temporary culverts included for haul road watercourse crossings and paths caused by haul roads may result in change to the existing flow regime and potential increase of flooding to the surrounding land. The embedded mitigation involves the inclusion of a pre-installed culvert of suitable size to accommodate the water volumes and flows necessary through agreement with the landowner and LLFA.	Negligible	Negligible (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		With the implementation of standard construction methods and mitigation measures described in Section 11.6 the risk from flooding can be effectively managed. As such, the magnitude of flooding from these sources during construction is considered to be Negligible, therefore the Significance of effect is Negligible and therefore Not Significant.		
Flood risk: Construction workers	Very High	The risk to construction workers primarily is flooding from fluvial, tidal, pluvial, groundwater and artificial sources. Fluvial flood risk could be exacerbated during construction works due to temporary increases as the rate and volume of runoff from an increase in impermeable areas, constricted flow from in-channel works and flumes and reduced floodplain storage potential. Should a fluvial flood event occur during construction this could be a significant risk to construction workers in the vicinity of watercourse crossings and on the floodplain, with the greatest risk occurring around the larger watercourses in the study area. For these areas of potential flood risk, construction flood mitigation measures would be applied to reduce the risk to the construction site and workers. The standard construction methods and mitigation are described in the Draft CEMP. Given this mitigation, the risk can be effectively managed (for example by monitoring weather forecasts and EA flood warnings; by undertaking works close to watercourses during periods of dry weather; by ensuring an adequate temporary drainage system is in place and maintained throughout the construction phase). The magnitude of impact is considered to be Negligible and therefore the Significance of effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not Significant)
Flood risk: residential areas	High	The installation of temporary culverts included for haul road watercourse crossings and paths caused by haul roads may result in changes to the existing flow regime and potential increase of flooding to the surrounding residential land. The magnitude of	Negligible	Negligible (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		impact of this risk is considered to be Negligible due to the pipeline primarily crossing through agricultural land and away from residential properties. The residential areas that do lie within the DCO Site Boundary and have the capacity to be impacted by downstream effects by being in the zone of influence are considered to be managed by the Embedded Mitigation (Section 11.6). Therefore, the significance of effect is Negligible and therefore Not Significant.		
Foul drainage: watercourses and/or Anglian water drainage network	Medium – High	There is the potential for increased foul drainage discharge due to construction workers on the laydown areas and construction compounds. This will be mitigated through the embedded mitigation whereby there will be an independently managed foul drainage system at the construction compounds with the foul water contained on site, regularly pumped, emptied, and transported off site. Therefore, the magnitude of impact is considered to be Negligible, and the significance of effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not Significant)
Potable water supply	Very High	The potential impact on potable water supply throughout the study area includes reduced availability of water for abstraction within surface water bodies due to abstraction for construction activities associated with installation of the pipeline. The associated embedded mitigation (Section 11.6) states that all abstractions will be sought from the Environment Agency, Lead Local Flood Authority / Internal Drainage Board (IDB) / Canal and River Trust where necessary. Abstraction licenses are also temporary (less than 28 days per water feature). Therefore, the magnitude of impact of reduced availability of water for potable supply is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not Significant)

Receptor	Type of impact and importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
Hydrostatic testing water impact on water supply	Very high	The water for hydrostatic testing is to be sourced from outside of the local area, and delivered to the site by road-going water tankers or from the P66 site. Therefore, the magnitude of impact of reduced availability of water for potable supply is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not Significant)

Assessment of Potential Impacts: Operational Phase

11.7.54 This section of the chapter considers the potential effects that the operation of the Proposed Development could have on the water environment.

11.7.55 There is a potential impact to the receiving surface water environment relating to operation is increased surface water runoff through increased impermeable or compacted areas resulting from the Immingham and Theddlethorpe Facilities, the Block Valve Stations, and the Dune Isolation Station. An increase in hardstanding area could result in increased run-off rates which can mobilise sediments and pollutants into water features. This also increases the risk of flooding also. To reduce these risks, embedded mitigation (Section 11.6) from the drainage strategy has been applied. Such measures include ensuring that the majority of the facilities and stations areas are permeable to minimise runoff. Where infiltration is not considered feasible, run-off will be discharged into swales and attenuation basins. Given this mitigation it is foreseen that the impacts are of short term duration and highly reversible.

11.7.56 There is also the potential impact to the operational staff at the Immingham and Theddlethorpe facilities associated with the residual tidal flood risk associated with a breach of the flood defences. The FRA (*ES Volume IV: Appendix 11.5 (Application Document 6.4.11.5)* contains details of the residual breach tidal flood risk to these facilities, with average modelled flood depths up to 3.25 m, 2.01 m, 2.06 m within the Immingham Facility, Theddlethorpe facility Option 1 and Theddlethorpe facility Option 2, respectively for the 0.1% AEP 2155 flood breach. Generally, the Theddlethorpe facility would be unmanned, however the Immingham facility will be manned. Neither site will remain operational during a breach flood event given that the facilities which feed CO_2 into the pipeline would shut down during the flood event. Given that the likelihood of a breach event occurring is very low, and the sites will not be operational during a breach event, the likelihood of an impact to the workers is very low, taking this into account it is considered that the impact to site operatives is low adverse. Given that the operatives importance are very high importance, and the significance of effect is moderate adverse (significant) without additional mitigation. The risks to the Proposed Development operation are considered in the FRA *ES Volume IV: Appendix 11.5 (Application Document 6.4.11.5)*).

11.7.57 Otherwise, there are no impacts on surface water receptors, flood risk and people, property and infrastructure anticipated with the buried pipeline, given that the pipeline will be buried to a suitable cover beneath the ground and watercourses. See *ES Volume IV: Appendix 11.5 (Application Document 6.4.11.5)* for further information.

11.7.58 Any repair or maintenance activities required during the operational life of the underground pipeline will result in impacts similar to those identified during construction but limited to the area of works.

11.7.59 The maintenance of the pipeline and the above ground infrastructure does not include any use of water resources (and therefore abstractions and discharges), therefore the impacts to the availability of potable water have been scoped out of this part of the assessment.

11.7.60 An assessment of the potential impacts for the Operational Phase is provided in **Table 11-24**.

Table 11-24: Assessment of Potential Impacts: Operational Phase

Receptor	Importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
Section 1				
Internal Drainage Board watercourses (including Harborough Marsh Drain)	Surface water: Medium	<u>Immingham Facility (surface water impacts)</u> The flow pathways associated with the Immingham Facility are South Killingholme Drain Branch 1 which lies to northern boundary of the facility South Killingholme Drain which lies to the west of the facilities boundary. The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased sedimentation and pollution entering watercourses. The magnitude of impact of increased run-off and risk of sedimentation and pollutions, is considered to be Negligible, therefore the significance of the effect is Minor and therefore Not Significant.	Negligible	Negligible (Not Significant)
	Flood risk: Medium	<u>Immingham Facility</u> The flow pathways associated with the Immingham Facility are South Killingholme Drain Branch 1 which lies to northern boundary of the facility South Killingholme Drain which lies to the west of the facilities boundary. The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased flood risk. In considering the embedded mitigation with the drainage associated with the facility, the magnitude of impact of increased run-off and risk of flooding, is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not Significant)
Other permanent surface water features	Surface water: Low	<u>Immingham Facility</u> While no mapped surface water drains (other than IDB watercourses) appear to connect to the Immingham Facility, it is likely that there are	Negligible	Negligible (Not Significant)

Receptor	Importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		numerous unnamed ditches, drains and small ponds across the study area, which although not directly affected by the proposed facility could still be impacted by the increased run-off from the increased hardstanding area. The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased sedimentation and pollution entering watercourses. The magnitude of impact of increased run-off and risk of sedimentation and pollutions, is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.		
Other permanent surface water features	Flood risk: Medium	<u>Immingham Facility</u> While no mapped surface water drains (other than IDB watercourses) appear to connect to the Immingham Facility, it is likely that there are numerous unnamed ditches, drains and small ponds across the study area, which although not directly affected by the proposed facility could still be impacted by the increased run-off from the increased hardstanding area. The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased flood risk. In considering the embedded mitigation with the drainage associated with the facility, the magnitude of impact of increased run-off and risk of flooding, is considered to be Negligible, therefore the significance of the effect is Minor and therefore Not Significant.	Negligible	Negligible (Not Significant)
Flood risk: Immingham Industrial Area (Section 1)	Flood risk: Medium	<u>Immingham Facility</u> The facility will be housed on VPI Immingham Land, which will be located in close proximity to South Killingholme Drain. The facility has the potential to increase the impermeable surface at the site. As, such the volume of surface water runoff generated by the facility, if left	Negligible	Negligible (Not significant)

Receptor	Importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		unmitigated, could increase runoff to nearby watercourses and increase flood risk. However, given the scale of the facility in comparison with the floodplain, the impact of an increase in floodwater volume is expected to be minimal. Therefore, the magnitude of impact is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.		
Section 2				
Other permanent water features	Surface water: Medium	<u>Washingdales Lane Block Valve Station</u> The Washingdales Lane Block Valve Station is not located near any WFD, IDB or main watercourses. From mapping it appears that there are no field or land drains that cross the area where the Block Valve Station is located. There is a potential flow pathway down Washingdales Lane which lies on a hill towards a road drain. However, the sides of the road towards to field drain are grassed and lined with hedgerows which will help dilute the potential impacts from increased run-off. With the associated drainage strategy with the Block Valve Station the magnitude of impact of increased run-off, sedimentation and pollution is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not Significant)
	Flood risk: Medium	<u>Washingdales Lane Block Valve Station</u> The Washingdales Lane Block Valve Station is not located near any WFD, IDB or main watercourses. From mapping it appears that there are no field or land drains that cross the area where the Block Valve Station is located. There is a potential flow pathway down Washingdales Lane which lies on a hill towards a road drain.	Negligible	Negligible (Not Significant)

Receptor	Importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		With the associated drainage strategy with the Block Valve Station the magnitude of impact of increased run-off and flood risk considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.		
Section 3				
Other permanent water features	Surface water: Medium	<u>Thoroughfare Block Valve Station</u> The Thoroughfare Block Valve Station is not located near any WFD, IDB or main watercourses. There are field drains to the north and south of working area which a potential flow pathway. However, the sides of the road (Thoroughfare) towards to field drain are grassed and lined with hedgerows which will help dilute the potential impacts of increased run-off. With the associated drainage strategy with the Block Valve Station the magnitude of impact of increased run-off, sedimentation and pollution is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
	Flood risk: Medium	<u>Thoroughfare Block Valve Station</u> The Thoroughfare Block Valve Station is not located near any WFD, IDB or main watercourses. There are field drains to the north and south of working area which a potential flow pathway. With the associated drainage strategy with the Block Valve Station the magnitude of impact of increased run-off and flood risk, is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
Section 4				
	Surface water: Medium	<u>Louth Road Block Valve Station</u>	Negligible	Negligible (Not significant)

Receptor	Importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
Internal Drainage Board water features		The Louth Road Block Valve Station is the other side of Louth Road from the laydown area. There is a field drain south of working area which a potential flow pathway to Upper South Drain. With the associated drainage strategy with the Block Valve Station the magnitude of impact of increased run-off, sedimentation and pollution is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.		
	Flood risk: Medium	<u>Louth Road Block Valve Station</u> The Louth Road Block Valve Station is the other side of Louth Road from the laydown area. There is a field drain south of working area which a potential flow pathway to Upper South Drain. With the associated drainage strategy with the Block Valve Station the magnitude of impact of increased run-off and flood risk is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
Other permanent water features	Surface water: Medium	<u>Louth Road Block Valve Station</u> The Louth Road Block Valve Station is the other side of Louth Road from the laydown area. There is a field drain south of working area which (the flow pathway to Upper South Drain) which may be impacted. With the associated drainage strategy with the Block Valve Station the magnitude of impact of increased run-off, sedimentation and pollution is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
	Flood risk: Medium	<u>Louth Road Block Valve Station</u>	Negligible	Negligible (Not significant)

Receptor	Importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		The Louth Road Block Valve Station is the other side of Louth Road from the laydown area. There is a field drain south of working area which (the flow pathway to Upper South Drain) which may be impacted. With the associated drainage strategy with the Block Valve Station the magnitude of impact of increased run-off and flood risk is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.		
Section 5				
Internal Drainage Board water features	Surface water: Medium	<u>Theddlethorpe Facility Option 1</u> Theddlethorpe Facility Option 1 is a new facility at the former Theddlethorpe Gas Terminal (TGT) site. IDB watercourses that have the potential to be impacted are Crook Bank Drain West which lies to the east of the proposed site. The downstream IDB receptors of Crook Bank Drain are Mablethorpe Lower Cut and Mablethorpe Urban Cut. The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased sedimentation and pollution entering watercourses. The magnitude of impact of increased run-off and risk of sedimentation and pollutions, is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Low	Negligible (Not significant)
	Flood risk: Medium	<u>Theddlethorpe Facility Option 2</u> Theddlethorpe Facility Option 2 is a new facility to the west of the former TGT site, located on arable land directly west of The Cut (an ordinary / IDB watercourse). The sites is bordered by Mablethorpe Lower Cut on its east side and the downstream receptors include Mablethorpe Urban Cut.	Negligible	Negligible (Not significant)

Receptor	Importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to flooding. The magnitude of impact of increased run-off and risk flood risk, is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.		
Other permanent water features	Surface water: Medium	<u>Theddlethorpe Facility Option 2</u> There are no flow receptors of 'other permanent water features' (other than IDB drains) for Option 1. For Option 2 there is an unnamed drain to the west of the facility which may be a potential receptor. This is also a flow pathway to the IDB drain Mablethorpe Lower Cut. The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased sedimentation and pollution entering watercourses. The magnitude of impact of increased run-off and risk of sedimentation and pollutions, is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
	Flood risk: Medium	<u>Theddlethorpe Facility Option 2</u> There are no flow receptors of 'other permanent water features' (other than IDB drains) for Option 1. For Option 2 there is an unnamed drain to the west of the facility which may be a potential receptor. This is also a flow pathway to the IDB drain Mablethorpe Lower Cut. The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to flooding. The magnitude of impact of increased run-off and risk flooding, is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.	Negligible	Negligible (Not significant)
	Surface water: Medium	<u>Dune Isolation Valve</u>	Negligible	Negligible (Not significant)

Receptor	Importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		The Dune Isolation Valve is located close to the sand dunes to the east of the existing valve station. It is located next to an un-named drain that provides drainage to the already existing site; therefore, this will also have the potential to be impacted through the construction works associated with the new Dune Valve. The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased sedimentation and pollution entering watercourses. The magnitude of impact of increased run-off and risk of sedimentation and pollutions, is considered to be Negligible, therefore the significance of the effect is Minor and therefore Not Significant.		
	Flood risk: Medium	<u>Dune Isolation Valve</u> The Dune Isolation Valve is located close to the sand dunes to the east of the existing valve station. It is located next to an un-named drain that provides drainage to the already existing site; therefore, this will also have the potential to be impacted through the construction works associated with the new Dune Valve. The increase in hardstanding area may impact local receptors through an increase in run-off which may lead flooding. The magnitude of impact of increased run-off and risk of flooding, is considered to be Negligible, therefore the significance of the effect is Minor and therefore Not Significant.	Negligible	Negligible (Not significant)
All sections				
Flood risk: agricultural land (All sections)	Medium	<u>Block Valve Stations</u> The three Block Valve Stations (Washingdales Lane, Thoroughfare and Louth Road) are all to be built on arable land. The stations have the potential to increase the impermeable surfaces at these sites, therefore	Negligible	Negligible (Not Significant)

Receptor	Importance	Description of impact, pathways, and scale/risk	Magnitude of impact	Significance of effect
		the volume of surface water runoff generated by the stations has the potential to increase flood risk. However, given the scale of the stations the impact of an increase in floodwater volume is expected to be minimal. Therefore, the magnitude of impact is considered to be Negligible, therefore the significance of the effect is Negligible and therefore Not Significant.		
Flood risk: Project workers (Sections 1 and 5)	Very High	There is a residual flood risk to the operational workers at the Theddlethorpe and Immingham facilities associated with a breach of the tidal flood defences. In the event that there is a breach in the tidal flood defences during a flood event, there could be a significant risk to workers. A breach event is very unlikely to occur and neither facility would remain operational during a tidal flood event. Given this, the risk can be effectively managed (for example by monitoring weather forecasts and EA flood warnings; by undertaking works close to watercourses during periods of dry weather; by ensuring an adequate temporary drainage system is in place and maintained throughout the construction phase). The magnitude of impact is considered to be Low and therefore the Significance of effect is Moderate and therefore Significant.	Low	Moderate Adverse (Significant)

Assessment of Potential Impacts: Decommissioning Phase

11.7.61 For this assessment, it has been considered that the pipeline will be left in-situ along its entire length, therefore the impacts associated with the decommissioning phase are related to the removal of above-ground facilities.

11.7.62 The scale and nature of activities undertaken during decommissioning would be similar to, and significantly lesser, than those described previously for construction, and they would be temporary during the period of decommissioning activities on site. A Decommissioning Environmental Management Plan (DEMP) will be produced prior to the decommissioning phase. Following the removal of the above ground structures and the reinstatement of the land there would be no further potential effects on hydrology and land drainage. The potential effects from decommissioning should therefore be regarded as the same as construction as described in greater detail above.

Sensitivity analysis

11.7.63 An analysis is required to illustrate how changes to the assessment may alter the outcomes predicted. The assessment fundamentally requires decisions to be made regarding the importance of a receptor and then the magnitude of impact. The magnitude of impact is further dependent on assumptions regarding the implementation and effectiveness of mitigation measures, which will be delivered by the appointed contractor.

11.7.64 It is considered that the receptors importance and sensitivity will not change either during construction, operation, or decommissioning. This is because a weight of evidence approach is adopted, with different levels of importance controlled primarily by scale and designations, both of which are unlikely to change. Importance is not determined using water quality, which can be more varied and thus introduce more uncertainty into the assessment.

11.7.65 In terms of magnitude of impacts, the nature of the works and the types of construction impacts that may occur are well understood and can be mitigated using standard and routine construction techniques and measures. Furthermore, the assessment has adopted a precautionary approach in the assessment effects. Thus, there is confidence in the prediction of impacts and the effectiveness of mitigation.

11.8 Additional Mitigation and Enhancement Measures

Additional Mitigation and Enhancement – Construction Phase

11.8.1 The Draft CEMP (*ES Volume IV: Appendix 3.1 (Application Document 6.4.3.1))* sets out the additional mitigation measures identified in this assessment of likely significant effects within the Draft Mitigation Register. This section summarises the types of mitigation measures that are proposed to provide additional mitigation for predicted effects on the water environment. Each entry in the Mitigation Register has an alpha-numerical reference e.g., 'G1' to provide a cross reference to the secured commitment. These measures will be adopted during the pre-construction, construction, and post-construction phases.

11.8.2 Enhancements are measures that are considered to be over and above any measures to avoid, reduce or remediate adverse impacts of the Proposed Development. There is an overall aim to achieve a Biodiversity Net Gain of 10% for the whole project, this will involve improvements to the water habitats metric. At the time of writing (August 2023) opportunities or enchantments are being identified, therefore have yet been agreed as to date of writing this ES, so are not assessed within this chapter.

Pre-Construction Mitigation and Enhancement

11.8.3 Measures to be undertake prior to construction works commencing and which are secured through the DCO via the requirement for a CEMP:

- **G1**: Prepare a Flood Warning and Evacuation Plan which contains information on flood emergency response actions;
- **G2**: The location and condition of existing land drainage will be established and a record compiled. Subject to landowner/occupier agreement, existing drains should be restored, or new drains established to help prevent damage to soil structure, maintain work areas in a dry condition and to enable current drainage systems to continue to operate through the construction period;
- **G3**: The design of these drainage schemes will be agreed by The Applicant's, the Contractor(s), and the landowners / occupiers. A specialist drainage contractor in most instances will carry out the work. Permanent records of the land drainage locations will be produced;
- **G4**: Seek the relevant permits / consents where required from the Environment Agency and Lead Local Flood Authority where necessary;
- **G5**: Water quality monitoring will be undertaken pre, during and post-construction on all watercourses alongside daily inspections. Where effects are identified through monitoring then additional mitigation should be identified;
- **G6:** A pre-construction Hydromorphological Survey of all proposed open-cut watercourse crossings will be undertaken to inform a Channel Reinstatement Scheme. This will ensure that the channel is reinstated as found or better, with riparian bankside treatments to return to watercourse corridor to at least its original condition;
- **G31:** Prepare a Water Efficiency Management Plan documenting measures to reduce water consumption by all water-using processes, activities and equipment on site. It will also include details of staff engagement and training for relevant staff as well as setting out monitoring and reporting requirements (as per CEMP) and how these will be implemented; and
- **G33:** Produce an Environmental Emergency Response Plan documenting measures to prevent pollutants infiltrating into the soils beneath the site and reaching surface and groundwater receptors.

Construction Mitigation and Enhancement

11.8.4 Measures to be undertake during construction works commencing and which are secured through the DCO via the requirement for a CEMP:

- **E3**: A more detailed hydrogeological risk assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. Where dewatering is required, a dewatering scheme will be developed prior to construction (in consultation with the Environment Agency and appropriate public water abstraction companies) to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to treat the water prior to controlled discharge. Any such assessment will consider the effects of any draw down or impacts on nearby abstractions or resources;
- **G9**: The temporary watercourse crossings will be designed to maintain downstream flows and to allow continued and unobstructed passage for aquatic organisms and mammals (otter and water vole) using river corridors. An EPS licence will exclude water vole from the area if present and if an otter holt is identified, this would be covered by the license also;
- **G10**: Flumes will be sized to maintain the current land drainage regime and the existing flow, following a study to understand the hydrology of the watercourse being crossed in order to assess the range of flows likely during the temporary works;
- **G11**: Following installation of the CO_2 pipeline, topsoil and excavated material will be reinstated, and a post-construction drainage system installed to ensure no detriment to the existing land drainage regime;
- **G13**: Appropriate equipment (e.g. spill kits) will be made available for all items of plant on site to deal with accidental spillages and the Pollution Prevention Plan will provide a full list of protocols and communication channels with the Environment Agency in the event of an accidental pollution incident;
- **G14**: Surface water runoff from the pipeline spread will be managed to prevent discharge of silted or contaminated water into any surface water feature or land drain. Details to be included in the Water Management Plan;
- **G15**: Where practicable, plant to be filled with biodegradable oil, in line with the plant manufacturer's instruction, to reduce the potential for pollution to watercourses in the event of a hydraulic oil pipe failure;
- **G16**: Watercourses near work sites would be inspected daily when work activity is being carried out. Inspections will need to consider locations upstream (control) and downstream of the working area so comparisons can be made. The Contractor should familiarise themselves with any other potential sources of contamination in advance of the works starting. During inspections any signs of pollution should be considered using visual and olfactory observations and in-situ water quality testing using hand-held water quality meters (that may include temperature, dissolved oxygen, pH, turbidity and electrical conductivity). Evidence of water pollution may include, but not limited to, siltation, deposits of aggregates and other materials or litter, turbidity, oil sheens, odours, dis-colourisation, surface foam and scum. Monitoring should continue daily for the duration of the works affecting each watercourse. Work site drainage and any interception, containment or treatment measures would also be regularly inspected and maintained as required during the works, so that it continues to operate to their design standard;

- **G17**: If a wheel washing system is proposed (rather than regular road sweeping), the wash down of construction vehicles and equipment will take place in designated washdown areas within construction compounds. Waste wash water should be prevented from passing untreated into watercourses or groundwater. Appropriate measures will include use of sediment traps;
- **G18**: Implement working methods that reduce water consumption and measures that improve water-use efficiency on site including:
    - Undertake water audits that identify all water-using processes, activities and equipment on Site (these will be updated periodically to reflect any significant changes in site activities through the Project life cycle);
    - Develop an action plan, including staff engagement and training for relevant staff, to reduce water consumption by all water-using processes, activities and equipment on site;
    - Undertake monitoring regime to assess the effectiveness of water conservation measures in the action plan; and
    - Establish a reporting regime to advise on the effectiveness of the action plan (which will be completed at a minimum of annually).
- **G19**: Any water abstracted due to dewatering would be treated and then returned to the watercourse to prevent any losses of water from the system, this would be subject to a contamination assessment;
- **G20**: Topsoil and subsoil will not be stored directly adjacent to the watercourse but will be stored a minimum of 20m from the watercourse, with additional mitigation such as silt fences installed if there is a risk of sediment entering the watercourse. No topsoil or subsoil will be stored within a fluvial or surface water flood zone (flood zone 2 and 3) unless supported by a risk assessment (i.e. consideration of weather forecast and duration of storage) and additional mitigation (i.e. drainage bypass channel for overland flow). Where site constraints mean that it is not possible to maintain a 20m buffer from a water body, additional mitigation measures will be implemented to provide an adequate barrier between the potential source of contaminated runoff and the receptor. Smaller stockpiles could be created, reducing the pile height;
- **G21**: A ‘frac-out’ (the unintentional return of drilling fluids to the surface) is a potential risk when HDD techniques is used in sensitive habitats and water environments. Frac-out during a trenchless operation can happen due to various reasons. To minimise the potential risk and potential impacts of a frac-out, risk assessments and contingency plans should be prepared;
- **G23**: Pea shingle/gravel to be used instead of sandbags. It is a larger aggregate that does not erode as quickly as sand. It is also easier to remove from a water feature than sand;
- **G24**: Where temporary crossings and open-cut crossings of drains connect to chalk streams, additional sediment management should be used such as straw bales being placed downstream of the crossing prior to flume removal. These will trap suspended sediment while allowing water to pass through the bales;
- **G25**: For water features that are being flumed, a phased approach of flume removal should be undertaken to remove the risk of large sediment plumes. There are multiple watercourses which drain into sensitive receptors which have the potential increase the cumulative effects on the water features, particularly through sediment inputs. A phased approach of removal would ensure that water features would not be impacted by multiple sources of sediment from upstream receptors simultaneously;

- **G26**: In the event that construction activities, including watercourse crossings, result in deposition of sediment within watercourses resulting in siltation of river beds, changes to morphology or result in loss of channel capacity, post-works restoration will be applied;
- **G28**: Use of flood resistant and resilient construction materials;
- **G29**: Facility users to sign up to the Environment Agency Flood Warning Service to receive flood warnings;
- **G30**: No maintenance visits during periods when a Flood Warning is in force;
- **G32:** Where it is necessary to remove vegetation, establish new/replacement vegetation (using local and/or reputable sources) as soon as practicable. Until vegetation is fully re-established, temporary protection of the soil may be necessary;
- **P23**: For the Theddlethorpe Facility critical electrical equipment should be raised a minimum of 300mm above the 2115 0.1% AEP breach depth of 2.01 m or 2.06 m (Option 1 and Option 2 respectively). This could be achieved by raising infrastructure on a table or if this is not possible then vulnerable infrastructure should be located within a watertight surround; and
- **P24**: For the Immingham Facility critical electrical equipment to be raised a minimum of 300mm above the 2115 0.1% AEP breach depth of 3.25 m, achieved by raising infrastructure on a table or locating vulnerable infrastructure within a watertight surround.

Additional Mitigation and Enhancement – Operational Phase

11.8.5 Measures to be undertake during the operational phase commencing and which are secured through the DCO via the requirement for a CEMP.

11.8.6 Based on information provided by the Environment Agency on breach flood water level models, additional mitigation has been proposed to manage the residual risk (see *ES Volume IV Appendix 11.5*) during operation.

- **G1:** A Flood Warning and Evacuation Plan should be provided;
- **G26:** In the event that construction activities, including watercourse crossings, result in deposition of sediment within watercourses resulting in siltation of river beds, changes to morphology or result in loss of channel capacity, post-works restoration will be applied;
- **G27:** Critical electrical equipment should be raised a minimum of 300mm above the 2115 0.1% AEP breach depth. Achieved by raising infrastructure or locating vulnerable infrastructure within a watertight surround;
- **G28**: Use of flood resistant and resilient construction materials;
- **G29:** Facility users to sign up to the Environment Agency Flood Warning Service to receive flood warnings; and
- **G30**: No maintenance visits during periods when a Flood Warning is in force.

11.8.7 The routine operation of the Proposed Development is not considered to have significant effects on the water environment as the principal watercourses crossed by the Proposed Development would be non-intrusive and drilled / bored beneath the bed at a sufficient depth to avoid exposure.

Additional Mitigation and Enhancement – Decommissioning Phase

11.8.8 The decommissioning phase would apply similar design and mitigation measures as the Construction Phase. Standard pollution prevention and construction good practices would be adopted to mitigate potential impacts upon the water environment where required and reasonably practicable.

11.8.9 The CEMP (Decommissioning) would be prepared and submitted prior to decommissioning of the Project for approval by the relevant bodies. The DEMP would be implemented by the Principal Contractor and would detail the types of risks pertinent to the construction works and the mitigation measures that would be required to avoid, minimise and reduce impacts of activities as far as practicable.

11.9 Residual Effects

11.9.1 This section summarises the residual effects of the Proposed Development on the Water Environment following the implementation of the additional mitigation highlighted in section 11.8 above.

Assessment of Residual Effects: Construction Phase

11.9.2 Residual effects are listed in **Table 11-25** for the construction phase.

11.9.3 After due consideration of the embedded and additional mitigation measures, all effects are assessed as not significant. There are changes in the North Beck Drain waterbody and Laceby Beck waterbody from Moderate to Minor adverse significance.

Assessment of Residual Effects: Operational Phase

11.9.4 Residual effects are listed in **Table 11-26** for the operational phase.

11.9.5 After due consideration of the embedded and additional mitigation measures, all effects are assessed as not significant. There are changes to the flood risk to Project Workers from Moderate Significance to Negligible (Not Significant).

Table 11-25: Summary of Construction Phase Residual Effects

Receptor	Receptor Importance	Description of impact	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
Section 1							
Skitter Beck / East Halton Beck Water Body (GB104029067655)	Surface Water: Very High	Northern Construction Compound (surface water impact) Runoff from the construction compound may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Negligible	Negligible (Not significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Negligible	**Negligible (Not significant)**
Internal Drainage Board water features	Surface Water: Medium	Immingham Facility Runoff from the facility may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Negligible	Negligible (Not significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Negligible	**Negligible (Not significant)**
Other permanent water features	Surface Water: Medium	Immingham Facility Runoff from the facility may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Low	Minor Adverse (Not Significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Low	**Minor Adverse (Not Significant)**
Immingham industrial area	Flood risk: Medium	Immingham Facility An increase in permeable area from the Immingham Facility which may increase the rate and volume of surface water runoff to the industrial area. Furthermore, during the construction phase there is a risk of displacing floodwater via the storage of materials/plant in the floodplain.	Negligible	Negligible (Not Significant)	No further specific mitigation.	Negligible	**Negligible (Not significant)**
Section 2							
North Beck Drain (GB104029067575)	Surface Water: Very High	Pipeline – Haul roads and laydown area (surface water impact) Runoff from haul roads and laydown areas may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Low	Moderate Adverse (Significant)	Additional mitigation has been considered for chalk streams and their tributaries dues to their sensitivities as receptors. Additional sediment management will be used such as straw bales being placed downstream of the crossing. These help trap suspended sediment while allowing water to pass through the bales. Water quality monitoring should be undertaken pre, during and post-construction alongside daily visual inspection to monitor the impacts on the chalk streams. To mitigate the impacts against falling aggregate from haul trucks, the culverts (flumes) crossing watercourses should be wider than the haul road themselves (approximately 1m either side of the culvert).	Negligible	**Minor Adverse (Not Significant)**

Receptor	Receptor Importance	Description of impact	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
	Surface Water: Very High	<u>Pipeline – Bailey bridge (surface water impact)</u> Temporary bridge crossings causing bed and bank disturbances which can cause excess fine sediments entering the watercourse.	Negligible	Negligible (Not significant)	No further specific mitigation. Temporary bridges will be clear span, with no bed or bank reinforcements, and foundations set well back from the bank edge. They will be sited to avoid tree/root loss and cross at straight reaches, perpendicular to flow where practicably possible.	Negligible	**Negligible (Not significant)**
	Surface Water: Very High	<u>Pipeline – HDD (surface water impact)</u> Runoff from the construction via HDD techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants. These may be exacerbated by the impact of low flows from dewatering of trenches.	Negligible	Negligible (Not significant)	A more detailed hydrological assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. Where dewatering is required, a dewatering scheme will be developed prior to construction (in consultation with the Environment Agency and appropriate public water abstraction companies) to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to the water prior to controlled discharge.	Negligible	**Negligible (Not significant)**
	Surface water: Very High	<u>Pipeline – Flumed Crossings (surface water impact)</u> Installation of temporary culverts will result in the loss of natural banks, loss of bed, change in flow dynamics, erosion patterns and lead to destabilisation of banks resulting in fine sediment deposition within the channel. This may lead to loss of morphological features and spawning habitat.	Low	Moderate Adverse (Significant)	Additional mitigation has been considered for chalk streams and their tributaries due to their sensitivities as receptors. Additional sediment management will be used such as straw bales being placed downstream of the crossing. These helps trap suspended sediment while allowing water to pass through the bales. Water quality monitoring should be undertaken pre, during and post-construction alongside daily visual inspection to monitor the impacts on the chalk streams. To mitigate the impacts against falling aggregate from haul trucks, the culverts (flumes) crossing watercourses should be wider than the haul road themselves (approximately 1m either side of the culvert).	Negligible	**Minor Adverse (Not Significant)**
Mawnbridge Drain (GB104029067540)	Surface Water: High	<u>Pipeline – Haul roads and laydown area (surface water impact)</u> Runoff from haul roads and laydown areas may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Negligible	Negligible (Not Significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Negligible	**Negligible (Not significant)**
Other permanent water features	Surface Water: Medium	<u>Washingdales Lane Block Valve Station (surface water impact)</u> Runoff from the block valve station may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Negligible	Negligible (Not Significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Negligible	**Negligible (Not significant)**

Receptor	Receptor Importance	Description of impact	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
Section 3							
Laceby Beck / River Freshney (to N Sea) (GB104029067530)	Surface Water: Very high	<u>Central Construction Compound (surface water impact)</u> Runoff from the construction compound may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Negligible	Negligible (Not significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Negligible	**Negligible (Not significant)**
	Surface Water: Very high	<u>Pipeline – Haul roads and laydown area (surface water impact)</u> Runoff from haul roads and laydown areas may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Negligible	Negligible (Not significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Negligible	**Negligible (Not significant)**
	Surface Water: Very high	<u>Pipeline – Auger bore (surface water impact)</u> Runoff from the construction via HDD techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants. These may be exacerbated by the impact of low flows from dewatering of trenches.	Negligible	Negligible (Not significant)	A more detailed hydrological assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. Where dewatering is required, a dewatering scheme will be developed prior to construction (in consultation with the Environment Agency and appropriate public water abstraction companies) to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to the water prior to controlled discharge.	Negligible	**Negligible (Not significant)**
	Surface Water: Very high	<u>Pipeline – Bailey bridge (surface water impact)</u> Temporary bridge crossings causing bed and bank disturbances which can cause excess fine sediments entering the watercourse.	Negligible	Negligible (Not significant)	No further specific mitigation. Temporary bridges will be clear span, with no bed or bank reinforcements, and foundations set well back from the bank edge. They will be sited to avoid tree/root loss and cross at straight reaches, perpendicular to flow where practicably possible.	Negligible	**Negligible (Not significant)**
Waithe Beck lower (to Tetney Lock) (GB104029062100)	Surface water: Very High	<u>Pipeline – Haul roads and laydown area (surface water impact)</u> Runoff from haul roads and laydown areas may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Negligible	Negligible (Not Significant)	Additional mitigation has been considered for chalk streams due to their sensitivities as receptors. Additional sediment management will be used such as straw bales being placed downstream of the crossing. These helps trap suspended sediment while allowing water to pass through the bales. Water quality monitoring should be undertaken pre, during and post-construction alongside daily visual inspection to monitor the impacts on the chalk streams. To mitigate the impacts against falling aggregate from haul trucks, the culverts (flumes) crossing watercourses should be wider than the haul road	Negligible	**Minor Adverse (Not Significant)**

Receptor	Receptor Importance	Description of impact	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
					themselves (approximately 1m either side of the culvert)		
	Surface water: Very High	<u>Pipeline – Auger bore (surface water impact)</u> Runoff from the construction via HDD techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants. These may be exacerbated by the impact of low flows from dewatering of trenches.	Negligible	Negligible (Not Significant)	A more detailed hydrological assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. Where dewatering is required, a dewatering scheme will be developed prior to construction (in consultation with the Environment Agency and appropriate public water abstraction companies) to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to the water prior to controlled discharge.	Negligible	**Negligible (Not significant)**
	Surface water: Very High	<u>Pipeline – Bailey bridge (surface water impact)</u> Temporary bridge crossings causing bed and bank disturbances which can cause excess fine sediments entering the watercourse.	Negligible	Negligible (Not Significant)	No further specific mitigation. Temporary bridges will be clear span, with no bed or bank reinforcements, and foundations set well back from the bank edge. They will be sited to avoid tree/root loss and cross at straight reaches, perpendicular to flow where practicably possible.	Negligible	**Negligible (Not significant)**
	Surface water: Very High	<u>Pipeline – Open cut (surface water impact)</u> Runoff from the construction via open cut techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Low	Moderate Adverse (Significant)	Additional mitigation has been considered for chalk streams and their tributaries due to their sensitivities as receptors. Additional sediment management will be used such as straw bales being placed downstream of the crossing. These helps trap suspended sediment while allowing water to pass through the bales. Water quality monitoring should be undertaken pre, during and post-construction alongside daily visual inspection to monitor the impacts on the chalk streams. To mitigate the impacts against falling aggregate from haul trucks, the culverts (flumes) crossing watercourses should be wider than the haul road themselves (approximately 1m either side of the culvert)	Negligible	**Minor Adverse (Not Significant)**
	Surface water: Very High	<u>Pipeline – Flumed crossings (surface water impact)</u> Installation of temporary culverts will result in the change in flow dynamics, erosion patterns and lead to destabilisation of banks resulting in fine sediment deposition within the channel.	Low	Moderate Adverse (Significant)	Additional mitigation has been considered for chalk streams and their tributaries due to their sensitivities as receptors. Additional sediment management will be used such as straw bales being placed before downstream of the crossing. These helps trap suspended sediment while allowing water to pass through the bales. Water quality monitoring should be undertaken pre, during and post-construction alongside daily visual inspection to monitor the impacts on the	Negligible	**Minor Adverse (Not Significant)**

Receptor	Receptor Importance	Description of impact	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
					chalk streams. To mitigate the impacts against falling aggregate from haul trucks, the culverts (flumes) crossing watercourses should be wider than the haul road themselves (approximately 1m either side of the culvert)		
Land Dike Drain to Louth Canal (West) (GB104029062162)	Surface Water: High	<u>Pipeline – Haul roads and laydown area</u> Runoff from haul roads and laydown areas may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Negligible	Negligible (Not Significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Negligible	**Negligible (Not Significant)**
	Surface Water: High	<u>Pipeline – Open cut crossings (surface water impact)</u> Runoff from the construction via open cut techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Low	Minor Adverse (Not Significant)	Crossing locations will be selected to make the crossing as close to perpendicular to the watercourse as reasonably practicable, ensuring the crossing is as short as possible and for open cut crossings reducing the risk of localised scour at the structures. Good site management, and implementation of the CEMP employing general pollution prevention measures.	Low	**Minor Adverse (Not Significant)**
	Surface Water: High	<u>Pipeline – Flumed crossings (surface water impact)</u> Installation of temporary culverts will result in the change in flow dynamics, erosion patterns and lead to destabilisation of banks resulting in fine sediment deposition within the channel.	Low	Minor Adverse (Not Significant)	Flumes will be sized to maintain the current land drainage regime and the existing flow, following a study to understand the hydrology of the watercourse being crossed in order to assess the range of flows likely during the temporary works. Crossing locations will be selected to make the crossing as close to perpendicular to the watercourse as reasonably practicable, ensuring the crossing is as short as possible and for flumed crossings reducing the risk of localised scour at the structures. Good site management, and implementation of the CEMP employing general pollution prevention measures.	Low	**Minor Adverse (Not Significant)**
Other permanent water features	Surface Water: Medium	<u>Thoroughfare Block Valve Station (surface water impact)</u> Runoff from the block valve station may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Low	Minor Adverse (Not significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Low	**Minor Adverse (Not significant)**
Section 4							
Poulton Drain (trib of Louth Canal) (GB104029062010)	Surface Water: High	<u>Pipeline – Haul roads and laydown area (surface water impact)</u> Runoff from haul roads and laydown areas may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Negligible	Negligible (Not Significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in	Negligible	**Negligible (Not Significant)**

Receptor	Receptor Importance	Description of impact	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
					Section 11.9) will ensure that runoff is managed in terms of quality.		
	Surface Water: High	<u>Pipeline – Auger bore (surface water impact)</u> Runoff from the construction via HDD techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants. These may be exacerbated by the impact of low flows from dewatering of trenches.	Negligible	Negligible (Not Significant)	A more detailed hydrological assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. Where dewatering is required, a dewatering scheme will be developed prior to construction (in consultation with the Environment Agency and appropriate public water abstraction companies) to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to the water prior to controlled discharge.	Negligible	**Negligible (Not significant)**
	Surface Water: High	<u>Pipeline – Bailey bridge (surface water impact)</u> Temporary bridge crossings causing bed and bank disturbances which can cause excess fine sediments entering the watercourse.	Negligible	Negligible (Not Significant)	No further specific mitigation. Temporary bridges will be clear span, with no bed or bank reinforcements, and foundations set well back from the bank edge. They will be sited to avoid tree/root loss and cross at straight reaches, perpendicular to flow where practicably possible.	Negligible	**Negligible (Not significant)**
Black Dyke (trib of Louth Canal) (GB104029062000)	Surface Water: High	<u>Pipeline – Haul roads and laydown area (surface water impact)</u> Runoff from haul roads and laydown areas may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Negligible	Negligible (Not Significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Negligible	**Negligible (Not Significant)**
	Surface Water: High	<u>Pipeline – Auger bore (surface water impact)</u> Runoff from the construction via HDD techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants. These may be exacerbated by the impact of low flows from dewatering of trenches.	Negligible	Negligible (Not Significant)	A more detailed hydrological assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. Where dewatering is required, a dewatering scheme will be developed prior to construction (in consultation with the Environment Agency and appropriate public water abstraction companies) to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to the water prior to controlled discharge.	Negligible	**Negligible (Not significant)**
	Surface Water: High	<u>Pipeline – Open-cut (surface water impact)</u> Runoff from the construction via open cut techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Low	Minor Adverse (Not Significant)	Crossing locations will be selected to make the crossing as close to perpendicular to the watercourse as reasonably practicable, ensuring the crossing is as short as possible and for open cut crossings reducing the risk of localised scour at the structures. Good site management, and	Low	**Minor Adverse (Not Significant)**

Receptor	Receptor Importance	Description of impact	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
					implementation of the CEMP employing general pollution prevention measures.		
	Surface Water: High	<u>Pipeline – Flumed access (surface water impact)</u> Installation of temporary culverts will result in the change in flow dynamics, erosion patterns and lead to destabilisation of banks resulting in fine sediment deposition within the channel.	Low	Minor Adverse (Not Significant)	Flumes will be sized to maintain the current land drainage regime and the existing flow, following a study to understand the hydrology of the watercourse being crossed in order to assess the range of flows likely during the temporary works. Crossing locations will be selected to make the crossing as close to perpendicular to the watercourse as reasonably practicable, ensuring the crossing is as short as possible and for flumed crossings reducing the risk of localised scour at the structures. Good site management, and implementation of the CEMP employing general pollution prevention measures.	Low	**Minor Adverse (Not Significant)**
Louth Canal (GB104029061990)	Surface Water: High	<u>Pipeline – Haul roads and laydown area (surface water impact)</u> Runoff from haul roads and laydown areas may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Low	Minor Adverse (Not Significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality. Crossing locations will be selected to make the crossing as close to perpendicular to the watercourse as reasonably practicable, ensuring the crossing is as short as possible and for open cut crossings reducing the risk of localised scour at the structures. No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures.	Low	**Minor Adverse (Not Significant)**
	Surface Water: High	<u>Pipeline – HDD (surface water impact)</u> Runoff from the construction via HDD techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants. These may be exacerbated by the impact of low flows from dewatering of trenches.	Negligible	Negligible (Not significant)	A more detailed hydrological assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. Where dewatering is required, a dewatering scheme will be developed prior to construction (in consultation with the Environment Agency and appropriate public water abstraction companies) to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to the water prior to controlled discharge.	Negligible	**Negligible (Not significant)**
South Dike and Grayfleet Drain (GB105029061680)	Surface Water: High	<u>Pipeline – Haul roads and laydown area (surface water impact)</u>	Negligible	Negligible (Not significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in	Negligible	**Negligible (Not significant)**

Receptor	Receptor Importance	Description of impact	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
		Runoff from haul roads and laydown areas may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.			Section 11.9) will ensure that runoff is managed in terms of quality.		
	Surface Water: High	<u>Pipeline – HDD (surface water impact)</u> Runoff from the construction via HDD techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants. These may be exacerbated by the impact of low flows from dewatering of trenches.	Negligible	Negligible (Not significant)	A more detailed hydrological assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. Where dewatering is required, a dewatering scheme will be developed prior to construction (in consultation with the Environment Agency and appropriate public water abstraction companies) to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to the water prior to controlled discharge.	Negligible	**Negligible (Not significant)**
	Surface Water: High	<u>Pipeline – Bailey bridge (surface water impact)</u> Temporary bridge crossings causing bed and bank disturbances which can cause excess fine sediments entering the watercourse.	Negligible	Negligible (Not significant)	No further specific mitigation. Temporary bridges will be clear span, with no bed or bank reinforcements, and foundations set well back from the bank edge. They will be sited to avoid tree/root loss and cross at straight reaches, perpendicular to flow where practicably possible.	Negligible	**Negligible (Not significant)**
Internal Drainage Board water features	Surface water: Low	<u>Louth Road Block Valve Station (surface water impact)</u> Runoff from the block valve station may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Negligible	Negligible (Not significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Negligible	**Negligible (Not significant)**
Other permanent water features	Surface water: Low	<u>Louth Road Block Valve Station (surface water impact)</u> Runoff from the block valve station may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Low	Minor Adverse (Not Significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Low	**Minor Adverse (Not Significant)**
Potable water supply: Covenham Reservoir Waterbody (Section 4 and 5)	Very High	Covenham Reservoir is a downstream receptor to Louth Canal and is at risk of receiving suspended fine sediments and chemical spillages from the watercourses that drain into it. The activities that carry this risk in particular are the open-cut crossings, flumed crossings (insertion and removal) and the haul roads.	Negligible	Negligible (Not Significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures.	Negligible	**Negligible (Not Significant)**

Receptor	Receptor Importance	Description of impact	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
Section 5							
Long Eau (GB105029061670)	Surface Water: High	<u>Pipeline – Haul roads and laydown area (surface water impact)</u> Runoff from haul roads and laydown areas may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Low	Minor Adverse (Not Significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Low	**Minor Adverse (Not Significant)**
	Surface Water: High	<u>Pipeline – HDD (surface water impact)</u> Runoff from the construction via HDD techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants. These may be exacerbated by the impact of low flows from dewatering of trenches.	Negligible	Negligible (Not Significant)	A more detailed hydrological assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. Where dewatering is required, a dewatering scheme will be developed prior to construction (in consultation with the Environment Agency and appropriate public water abstraction companies) to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to the water prior to controlled discharge.	Negligible	**Negligible (Not Significant)**
Great Eau (d/s of South Thoresby) (GB105029061660)	Surface Water: High	<u>Pipeline – Haul roads and laydown area (surface water impact)</u> Runoff from haul roads and laydown areas may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Negligible	Negligible (Not significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Negligible	**Negligible (Not significant)**
	Surface Water: High	<u>Pipeline – HDD (surface water impact)</u> Runoff from the construction via HDD techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants. These may be exacerbated by the impact of low flows from dewatering of trenches.	Negligible	Negligible (Not significant)	A more detailed hydrological assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. Where dewatering is required, a dewatering scheme will be developed prior to construction (in consultation with the Environment Agency and appropriate public water abstraction companies) to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to the water prior to controlled discharge.	Negligible	**Negligible (Not significant)**
Internal Drainage Board watercourses: Mills and Harps Drain & Rotten Row Drain	Surface water: High	<u>Pipeline – Haul roads and laydown areas (surface water impact)</u> Runoff from haul roads and laydown areas may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Low	Minor Adverse (Not Significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Negligible	**Negligible (Not significant)**

Receptor	Receptor Importance	Description of impact	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
	Surface water: High	<u>Flumed crossings (surface water impact)</u> Installation of temporary culverts will result in the change in flow dynamics, erosion patterns and lead to destabilisation of banks resulting in fine sediment deposition within the channel.	Low	Minor Adverse (Not Significant)	Flumes will be sized to maintain the current land drainage regime and the existing flow, following a study to understand the hydrology of the watercourse being crossed in order to assess the range of flows likely during the temporary works. Crossing locations will be selected to make the crossing as close to perpendicular to the watercourse as reasonably practicable, ensuring the crossing is as short as possible and for flumed crossings reducing the risk of localised scour at the structures. Good site management, and implementation of the CEMP employing general pollution prevention measures.	Low	**Minor Adverse (Not Significant)**
	Surface water: High	<u>Pipeline – Open cut crossing (surface water impact)</u> Runoff from the construction via open cut techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Low	Minor Adverse (Not Significant)	Crossing locations will be selected to make the crossing as close to perpendicular to the watercourse as reasonably practicable, ensuring the crossing is as short as possible and for open cut crossings reducing the risk of localised scour at the structures. Good site management, and implementation of the CEMP employing general pollution prevention measures.	Low	**Minor Adverse (Not Significant)**
	Surface water: High	<u>Pipeline - HDD (surface water impact)</u> Runoff from the construction via HDD techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants. These may be exacerbated by the impact of low flows from dewatering of trenches.	Negligible	Negligible (Not significant)	A more detailed hydrological assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. Where dewatering is required, a dewatering scheme will be developed prior to construction (in consultation with the Environment Agency and appropriate public water abstraction companies) to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to the water prior to controlled discharge.	Negligible	**Negligible (Not significant)**
Internal Drainage Board water features	Surface Water: Medium	<u>Southern Construction Compound (surface water impact)</u> Runoff from the construction compound area may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Negligible	Negligible (Not significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Negligible	**Negligible (Not significant)**
	Surface Water: Medium	<u>Theddlethorpe Facility Option 1 (surface water impact)</u> Runoff from the facility may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Low	Minor Adverse (Not significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality	Low	**Minor Adverse (Not significant)**

Receptor	Receptor Importance	Description of impact	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
	Surface Water: Medium	<u>Theddlethorpe Facility Option 2 (surface water impact)</u> Runoff from the facility may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Low	Minor Adverse (Not significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Low	**Minor Adverse (Not significant)**
Other permanent water features	Surface Water: Medium	<u>Theddlethorpe Facility Option 1 (surface water impact)</u> Runoff from the facility may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Low	Minor Adverse (Not significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality	Low	**Minor Adverse (Not significant)**
	Surface Water: Medium	<u>Theddlethorpe Facility Option 2 (surface water impact)</u> Runoff from the facility may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Low	Minor Adverse (Not significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Low	**Minor Adverse (Not significant)**
	Surface Water: Medium	<u>Dune Isolation Valve (surface water impact)</u> Runoff from the facility may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Negligible	Negligible (Not significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality	Negligible	**Negligible (Not significant)**
Saltfleetby - Theddlethorpe Dunes SAC, NNR and SSSI	Surface water: High	<u>Dune Isolation Valve (surface water impact)</u> Runoff from the facility may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Negligible	Negligible (Not significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality	Negligible	**Negligible (Not significant)**
Potable water supply: Covenham Reservoir Waterbody (Section 4 and 5)	Very High	Covenham Reservoir is a downstream receptor to Louth Canal and is at risk of receiving suspended fine sediments and chemical spillages from the watercourses that drain into it. The activities that carry this risk in particular are the open-cut crossings, flumed crossings (insertion and removal) and the haul roads.	Negligible	Negligible (Not Significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures.	Negligible	**Negligible (Not Significant)**
All sections							
Internal Drainage Board watercourses	Surface water: Medium	<u>Pipeline – Haul roads and laydown areas (surface water impact)</u> Runoff from haul roads and laydown areas may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Negligible	Negligible (Not Significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in	Negligible	**Negligible (Not Significant)**

Receptor	Receptor Importance	Description of impact	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
					Section 11.9) will ensure that runoff is managed in terms of quality.		
	Surface water: Medium	<u>Flumed crossings (surface water impact)</u> Installation of temporary culverts will result in the change in flow dynamics, erosion patterns and lead to destabilisation of banks resulting in fine sediment deposition within the channel.	Low	Minor Adverse (Not significant)	Crossing locations will be selected to make the crossing as close to perpendicular to the watercourse as reasonably practicable, ensuring the crossing is as short as possible and for flumed crossings reducing the risk of localised scour at the structures. Good site management, and implementation of the CEMP employing general pollution prevention measures.	Low	**Minor Adverse (Not significant)**
	Hydromorphology: Low	<u>Flumed crossings (hydromorphological impact)</u> Installation of temporary culverts will result in the loss of natural banks, loss of bed, change in flow dynamics, erosion patterns and lead to destabilisation of banks resulting in fine sediment deposition within the channel. This may lead to loss of morphological features and spawning habitat.	Low	Minor Adverse (Not significant)	Crossing locations will be selected to make the crossing as close to perpendicular to the watercourse as reasonably practicable, ensuring the crossing is as short as possible and for flumed crossings reducing the risk of localised scour at the structures. Good site management, and implementation of the CEMP employing general pollution prevention measures.	Low	**Minor Adverse (Not significant)**
	Surface water: Medium	<u>Pipeline – Open cut crossing (surface water impact)</u> Runoff from the construction via open cut techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Low	Minor Adverse (Not significant)	Crossing locations will be selected to make the crossing as close to perpendicular to the watercourse as reasonably practicable, ensuring the crossing is as short as possible and for open cut crossings reducing the risk of localised scour at the structures. Good site management, and implementation of the CEMP employing general pollution prevention measures.	Low	**Minor Adverse (Not significant)**
	Hydromorphology: Low	<u>Pipeline – Open cut crossing (hydromorphological impact)</u> Open-cut techniques will result in the loss of natural banks, loss of bed, change in flow dynamics, erosion patterns and lead to destabilisation of banks resulting in fine sediment deposition within the channel. This may lead to loss of morphological features and spawning habitat.	Low	Minor Adverse (Not significant)	Crossing locations will be selected to make the crossing as close to perpendicular to the watercourse as reasonably practicable, ensuring the crossing is as short as possible and for open cut crossings reducing the risk of localised scour at the structures. Good site management, and implementation of the CEMP employing general pollution prevention measures.	Low	**Minor Adverse (Not significant)**
	Surface water: Medium	<u>Pipeline – Auger bore (surface water impact)</u> Runoff from the construction via auger bore techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants. These may be exacerbated by the impact of low flows from dewatering of trenches.	Negligible	Negligible (Not Significant)	A more detailed hydrological assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. Where dewatering is required, a dewatering scheme will be developed prior to construction (in consultation with the Environment Agency and appropriate public water abstraction companies) to demonstrate that there is an effective strategy	Negligible	**Negligible (Not Significant)**

Receptor	Receptor Importance	Description of impact	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
					to manage water arising from the operations and, where required, sufficient proposals to the water prior to controlled discharge.		
	Surface water: Medium	<u>Pipeline – HDD (surface water impact)</u> Runoff from the construction via HDD techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants. These may be exacerbated by the impact of low flows from dewatering of trenches.	Negligible	Negligible (Not Significant)	A more detailed hydrological assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. Where dewatering is required, a dewatering scheme will be developed prior to construction (in consultation with the Environment Agency and appropriate public water abstraction companies) to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to the water prior to controlled discharge.	Negligible	**Negligible (Not Significant)**
Other permanent surface water features	Surface water: Medium	<u>Pipeline – Haul roads and laydown areas (surface water impact)</u> Runoff from haul roads and laydown areas may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Negligible	Negligible (Not Significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Negligible	**Negligible (Not Significant)**
	Surface water: Medium	<u>Flumed crossings (surface water impact)</u> Installation of temporary culverts will result in the change in flow dynamics, erosion patterns and lead to destabilisation of banks resulting in fine sediment deposition within the channel.	Low	Minor Adverse (Not significant)	Crossing locations will be selected to make the crossing as close to perpendicular to the watercourse as reasonably practicable, ensuring the crossing is as short as possible and for flumed crossings reducing the risk of localised scour at the structures. Good site management, and implementation of the CEMP employing general pollution prevention measures.	Low	**Minor Adverse (Not significant)**
	Hydromorphology: Medium	<u>Flumed crossings (hydromorphological impact)</u> Installation of temporary culverts will result in the loss of natural banks, loss of bed, change in flow dynamics, erosion patterns and lead to destabilisation of banks resulting in fine sediment deposition within the channel. This may lead to loss of morphological features and spawning habitat.	Low	Minor Adverse (Not significant)	Crossing locations will be selected to make the crossing as close to perpendicular to the watercourse as reasonably practicable, ensuring the crossing is as short as possible and for flumed crossings reducing the risk of localised scour at the structures. Good site management, and implementation of the CEMP employing general pollution prevention measures.	Low	**Minor Adverse (Not significant)**
	Surface water: Medium	<u>Pipeline – Open cut crossing (surface water impact)</u> Runoff from the construction via open cut techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants.	Low	Minor Adverse (Not significant)	Crossing locations will be selected to make the crossing as close to perpendicular to the watercourse as reasonably practicable, ensuring the crossing is as short as possible and for open cut crossings reducing the risk of localised scour at the structures. Good site management, and	Low	**Minor Adverse (Not significant)**

Receptor	Receptor Importance	Description of impact	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
					implementation of the CEMP employing general pollution prevention measures.		
	Hydromorphology: Medium	<u>Pipeline – Open cut crossing (hydromorphological impact)</u> Open-cut techniques will result in the loss of natural banks, loss of bed, change in flow dynamics, erosion patterns and lead to destabilisation of banks resulting in fine sediment deposition within the channel. This may lead to loss of morphological features and spawning habitat.	Low	Minor Adverse (Not significant)	Crossing locations will be selected to make the crossing as close to perpendicular to the watercourse as reasonably practicable, ensuring the crossing is as short as possible and for open cut crossings reducing the risk of localised scour at the structures. Good site management, and implementation of the CEMP employing general pollution prevention measures.	Low	**Minor Adverse (Not significant)**
	Surface water: Medium	<u>Pipeline – Auger bore (surface water impact)</u> Runoff from the construction via auger bore techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants. These may be exacerbated by the impact of low flows from dewatering of trenches.	Negligible	Negligible (Not Significant)	A more detailed hydrological assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. Where dewatering is required, a dewatering scheme will be developed prior to construction (in consultation with the Environment Agency and appropriate public water abstraction companies) to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to the water prior to controlled discharge.	Negligible	**Negligible (Not Significant)**
	Surface water: Medium	<u>Pipeline – HDD (surface water impact)</u> Runoff from the construction via HDD techniques may lead to pollution due to increased sedimentation, fuel spills, oils and lubricants. These may be exacerbated by the impact of low flows from dewatering of trenches.	Negligible	Negligible (Not Significant)	A more detailed hydrological assessment will be undertaken at FEED stage, where trenchless techniques or dewatering is required in high sensitivity groundwater environments. Where dewatering is required, a dewatering scheme will be developed prior to construction (in consultation with the Environment Agency and appropriate public water abstraction companies) to demonstrate that there is an effective strategy to manage water arising from the operations and, where required, sufficient proposals to the water prior to controlled discharge.	Negligible	**Negligible (Not Significant)**
Ephemeral and /or artificial drainage ditches	Surface water: Low	<u>Surface Water Impact</u> Impacted by uncontrolled site runoff laden with fine sediment or accidental spillages from plant or other construction chemicals.	Negligible	Negligible (Not significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Negligible	**Negligible (Not significant)**
Humber Estuary (WFD / SAC) (Section 1 – 4)	Surface water: Very High	<u>Surface Water Impact</u>	Negligible	Negligible (Not significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention	Negligible	**Negligible (Not significant)**

Receptor	Receptor Importance	Description of impact	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
		All construction work associated with these watercourses have the potential to propagate sediments and spillages downstream			measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.		
Lincolnshire Waterbody (coastal WFD) (Section 1 – 5)	Surface water: High-	<u>Surface Water Impact</u> All construction work associated with these watercourses have the potential to propagate sediments and spillages downstream	Negligible	Negligible (Not significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general pollution prevention measures. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of quality.	Negligible	**Negligible (Not significant)**
Flood risk: agricultural land	Medium	Installation of temporary culverts included for haul road watercourse crossings and paths caused by haul roads may result in change to the existing flow regime and potential increase of flooding to the surrounding land.	Negligible	Negligible (Not Significant)	No further specific mitigation. Good site management, and implementation of the CEMP employing general flood risk. Drainage measures (detailed in Section 11.9) will ensure that runoff is managed in terms of volume.	Negligible	**Negligible (Not Significant)**
Flood risk: Construction workers	Very High	The risk to construction workers primarily is flooding from fluvial, tidal, pluvial, groundwater and artificial sources. Fluvial flood risk could be exacerbated during construction works due to temporary increases as the rate and volume of runoff from an increase in impermeable areas, constricted flow from in-channel works and flumes and reduced floodplain storage potential. Should a fluvial flood event occur during construction this could be a significant risk to construction workers in the vicinity of watercourse crossings and on the floodplain, with the greatest risk occurring around the larger watercourses in the study area.	Negligible	Negligible (Not Significant)	A Flood Warning and Evacuation Plan which contains information on flood emergency response actions will be drafted by the Contractor during the Pre-Construction stage.	Negligible	**Negligible (Not Significant)**
Flood risk: residential areas	High	The installation of temporary culverts included for haul road watercourse crossings and paths caused by haul roads may result in changes to the existing flow regime and potential increase of flooding to the surrounding residential land.	Negligible	Negligible (Not Significant)	No further specific mitigation.	Negligible	**Negligible (Not Significant)**
Foul drainage: watercourses and/or Anglian water drainage network	Medium – High	There is the potential for increased foul drainage discharge due to construction workers on the laydown areas and construction compounds	Negligible	Negligible (Not Significant)	Undertake water audits that identify all water-using processes, activities and equipment on Site (these will be updated periodically to reflect any significant changes in site activities through the Project life cycle). Develop an action plan, including staff engagement and training for relevant staff, to reduce water consumption by all water-using processes, activities and equipment on site.	Negligible	**Negligible (Not Significant)**

Receptor	Receptor Importance	Description of impact	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
Potable water supply	Very High	The potential impact on potable water supply throughout the study area includes reduced availability of water for abstraction within surface water bodies due to abstraction for construction activities associated with installation of the pipeline	Negligible	Negligible (Not Significant)	No further specific mitigation.	Negligible	**Negligible (Not Significant)**
Hydrostatic testing water impact on water supply	Very high	The potential impact on reduced available water for potable supply.	Negligible	Negligible (Not Significant)	No further specific mitigation.	Negligible	**Negligible (Not Significant)**

Table 11-26: Summary of Operational Phase Residual Effects

Receptor	Importance	Description of impact, pathways, and scale/risk	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
Section 1							
Internal Drainage Board watercourses (including Harborough Marsh Drain)	Surface water: Medium	<u>Immingham Facility (surface water impacts)</u> The flow pathways associated with the Immingham Facility are South Killingholme Drain Branch 1 which lies to northern boundary of the facility South Killingholme Drain which lies to the west of the facilities boundary. The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased sedimentation and pollution entering watercourses.	Negligible	Negligible (Not Significant)	In the event that construction activities, including watercourse crossings, result in deposition of sediment within watercourses resulting in siltation of river beds, changes to morphology or result in loss of channel capacity, post-works restoration will be applied.	Negligible	**Negligible (Not Significant)**
	Flood risk: Medium	<u>Immingham Facility</u> The flow pathways associated with the Immingham Facility are South Killingholme Drain Branch 1 which lies to northern boundary of the facility South Killingholme Drain which lies to the west of the facilities boundary. The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased flood risk.	Negligible	Negligible (Not Significant)	No additional mitigation required above the embedded mitigation of the Drainage Strategy (*ES Volume IV: Appendix 11.3 (Application Document 6.4.11*.3)).	Negligible	**Negligible (Not Significant)**
Other permanent surface water features	Surface water: Low	<u>Immingham Facility</u> While no mapped surface water drains (other than IDB watercourses) appear to connect to the Immingham Facility, it is likely that there are numerous unnamed ditches, drains and small ponds across the study area, which although not directly affected by the proposed facility could still be impacted by the increased run-off from the increased hardstanding area. The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased sedimentation and pollution entering watercourses.	Negligible	Negligible (Not Significant)	In the event that construction activities, including watercourse crossings, result in deposition of sediment within watercourses resulting in siltation of river beds, changes to morphology or result in loss of channel capacity, post-works restoration will be applied.	Negligible	**Negligible (Not Significant)**
Other permanent surface water features	Flood risk: Medium	<u>Immingham Facility</u> While no mapped surface water drains (other than IDB watercourses) appear to connect to the Immingham Facility, it is likely that there are numerous unnamed ditches, drains and small ponds across the study area, which although not directly affected by the proposed facility could still be impacted by the increased run-off from the increased hardstanding area.	Negligible	Negligible (Not Significant)	No additional mitigation required above the embedded mitigation of the Drainage Strategy (*ES Volume IV: Appendix 11.3 (Application Document 6.4.11.3*)).	Negligible	**Negligible (Not Significant)**

Receptor	Importance	Description of impact, pathways, and scale/risk	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
		The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased flood risk.					
Flood risk: Immingham Industrial Area (Section 1)	Flood risk: Medium	<u>Immingham Facility</u> The facility will be housed on VPI Immingham Land, which will be located in close proximity to South Killingholme Drain. The facility has the potential to increase the impermeable surface at the site. As, such the volume of surface water runoff generated by the facility, if left unmitigated, could increase runoff to nearby watercourses and increase flood risk. However, given the scale of the facility in comparison with the floodplain, the impact of an increase in floodwater volume is expected to be minimal.	Negligible	Negligible (Not significant)	No additional mitigation required above the embedded mitigation of the Drainage Strategy (*ES Volume IV: Appendix 11.3 (Application Document 6.4.11.3*)).	Negligible	**Negligible (Not significant)**
Section 2							
Other permanent water features	Surface water: Medium	<u>Washingdales Lane Block Valve Station</u> The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased sedimentation and pollution entering watercourses.	Negligible	Negligible (Not Significant)	In the event that construction activities, including watercourse crossings, result in deposition of sediment within watercourses resulting in siltation of river beds, changes to morphology or result in loss of channel capacity, post-works restoration will be applied.	Negligible	**Negligible (Not Significant)**
	Flood risk: Medium	<u>Washingdales Lane Block Valve Station</u> The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased flood risk.	Negligible	Negligible (Not Significant)	No additional mitigation required above the embedded mitigation of the Drainage Strategy (*ES Volume IV: Appendix 11.3 (Application Document 6.4.11.3*)).	Negligible	**Negligible (Not Significant)**
Section 3							
Other permanent water features	Surface water: Medium	<u>Thoroughfare Block Valve Station</u> The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased sedimentation and pollution entering watercourses.	Negligible	Negligible (Not significant)	In the event that construction activities, including watercourse crossings, result in deposition of sediment within watercourses resulting in siltation of river beds, changes to morphology or result in loss of channel capacity, post-works restoration will be applied.	Negligible	**Negligible (Not significant)**
	Flood risk: Medium	<u>Thoroughfare Block Valve Station</u> The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased flood risk.	Negligible	Negligible (Not significant)	No additional mitigation required above the embedded mitigation of the Drainage Strategy (*ES Volume IV: Appendix 11.3 (Application Document 6.4.11.3*)).	Negligible	**Negligible (Not significant)**
Section 4							
Internal Drainage Board water features	Surface water: Medium	<u>Louth Road Block Valve Station</u> The increase in hardstanding area may impact local receptors through an increase in run-off	Negligible	Negligible (Not significant)	In the event that construction activities, including watercourse crossings, result in deposition of sediment within watercourses resulting in	Negligible	**Negligible (Not significant)**

Receptor	Importance	Description of impact, pathways, and scale/risk	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
		which may lead to increased sedimentation and pollution entering watercourses.			siltation of river beds, changes to morphology or result in loss of channel capacity, post-works restoration will be applied.		
	Flood risk: Medium	Louth Road Block Valve Station The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased flood risk.	Negligible	Negligible (Not significant)	No additional mitigation required above the embedded mitigation of the Drainage Strategy (*ES Volume IV: Appendix 11.3 (Application Document 6.4.11.3*)).	Negligible	**Negligible (Not significant)**
Other permanent water features	Surface water: Medium	Louth Road Block Valve Station The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased sedimentation and pollution entering watercourses.	Negligible	Negligible (Not significant)	In the event that construction activities, including watercourse crossings, result in deposition of sediment within watercourses resulting in siltation of river beds, changes to morphology or result in loss of channel capacity, post-works restoration will be applied.	Negligible	**Negligible (Not significant)**
	Flood risk: Medium	Louth Road Block Valve Station The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased flood risk.	Negligible	Negligible (Not significant)	No additional mitigation required above the embedded mitigation of the Drainage Strategy (*ES Volume IV: Appendix 11.3 (Application Document 6.4.11.3*)).	Negligible	**Negligible (Not significant)**
Section 5							
Internal Drainage Board water features	Surface water: Medium	Theddlethorpe Facility Option 1 Theddlethorpe Facility Option 1 is a new facility at the former Theddlethorpe Gas Terminal (TGT) site. IDB watercourses that have the potential to be impacted are Crook Bank Drain West which lies to the east of the proposed site. The downstream IDB receptors of Crook Bank Drain are Mablethorpe Lower Cut and Mablethorpe Urban Cut. The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased sedimentation and pollution entering watercourses	Low	Negligible (Not significant)	In the event that construction activities, including watercourse crossings, result in deposition of sediment within watercourses resulting in siltation of river beds, changes to morphology or result in loss of channel capacity, post-works restoration will be applied.	Negligible	Negligible (Not significant)
	Flood risk: Medium	Theddlethorpe Facility Option 2 Theddlethorpe Facility Option 2 is a new facility to the west of the former TGT site, located on arable land directly west of The Cut (an ordinary / IDB watercourse). The sites is bordered by Mablethorpe Lower Cut on its east side and the downstream receptors include Mablethorpe Urban Cut.	Negligible	Negligible (Not significant)	No additional mitigation required above the embedded mitigation of the Drainage Strategy (*ES Volume IV: Appendix 11.3 (Application Document 6.4.11*.3)).	Negligible	**Negligible (Not significant)**
Other permanent water features	Surface water: Medium	Theddlethorpe Facility Options There are no flow receptors of 'other permanent water features' (other than IDB drains) for Option 1. For Option 2 there is an unnamed drain to the west of the facility which may be a potential	Negligible	Negligible (Not significant)	In the event that construction activities, including watercourse crossings, result in deposition of sediment within watercourses resulting in siltation of river beds, changes to morphology or	Negligible	**Negligible (Not significant)**

Receptor	Importance	Description of impact, pathways, and scale/risk	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
		receptor. This is also a flow pathway to the IDB drain Mablethorpe Lower Cut. The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased sedimentation and pollution entering watercourses.			result in loss of channel capacity, post-works restoration will be applied.		
	Flood risk: Medium	<u>Theddlethorpe Facility Option 2</u> There are no flow receptors of 'other permanent water features' (other than IDB drains) for Option 1. For Option 2 there is an unnamed drain to the west of the facility which may be a potential receptor. This is also a flow pathway to the IDB drain Mablethorpe Lower Cut. The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to flooding.	Negligible	Negligible (Not significant)	No additional mitigation required above the embedded mitigation of the Drainage Strategy (*ES Volume IV: Appendix 11.3 (Application Document 6.4.11.3*)).	Negligible	**Negligible (Not significant)**
	Surface water: Medium	<u>Dune Isolation Valve</u> The Dune Isolation Valve is located close to the sand dunes to the east of the existing valve station. It is located next to an un-named drain that provides drainage to the already existing site; therefore, this will also have the potential to be impacted through the construction works associated with the new Dune Valve. The increase in hardstanding area may impact local receptors through an increase in run-off which may lead to increased sedimentation and pollution entering watercourses.	Negligible	Negligible (Not significant)	In the event that construction activities, including watercourse crossings, result in deposition of sediment within watercourses resulting in siltation of river beds, changes to morphology or result in loss of channel capacity, post-works restoration will be applied.	Negligible	**Negligible (Not significant)**
	Flood risk: Medium	<u>Dune Isolation Valve</u> The Dune Isolation Valve is located close to the sand dunes to the east of the existing valve station. It is located next to an un-named drain that provides drainage to the already existing site; therefore, this will also have the potential to be impacted through the construction works associated with the new Dune Valve. The increase in hardstanding area may impact local receptors through an increase in run-off which may lead flooding.	Negligible	Negligible (Not significant)	No additional mitigation required above the embedded mitigation of the Drainage Strategy (*ES Volume IV: Appendix 11.3 (Application Document 6.4.11.*3)).	Negligible	**Negligible (Not significant)**

Receptor	Importance	Description of impact, pathways, and scale/risk	Potential Effect		Additional Mitigation Measures	Residual Effect	
			Magnitude	Significance		Magnitude	Significance
All sections							
Flood risk: agricultural land (All sections)	Medium	<u>Block Valve Stations</u> The three Block Valve Stations (Washingdales Lane, Thoroughfare and Louth Road) are all to be built on arable land. The stations have the potential to increase the impermeable surfaces at these sites, therefore the volume of surface water runoff generated by the stations has the potential to increase flood risk.	Negligible	Negligible (Not Significant)	No additional mitigation required above the embedded mitigation of the Drainage Strategy (*ES Volume IV: Appendix 11.3 (Application Document 6.4.11*.3)).	Negligible	**Negligible (Not Significant)**
Flood risk: Project workers (Sections 1 and 5)	Very High	There is a residual flood risk to the operational workers at the Theddlethorpe and Immingham facilities associated with a breach of the tidal flood defences. In the event that there is a breach in the tidal flood defences during a flood event, there could be a significant risk to workers. A breach event is very unlikely to occur and neither facility would remain operational during a tidal flood event.	Negligible	Negligible (Not Significant)	The mitigation for the residual flood risk against Project workers includes the provision of a Flood Warning and Evacuation Plan, the facility users to sign up to the EA Flood Warning Service to receive flood warnings and there will be no maintenance visits during periods when a Flood Warning is in force. Given this, the risk can be effectively managed.	Negligible	**Negligible (Not Significant)**

11.10 Monitoring

Construction Monitoring

11.10.1 The water quality monitoring programme (detailed in the Outline Water Management Plan *(ES Volume VI, Appendix 11.6 (Application Document 6.4.11.6)),* will be developed that will ensure that good practices are being followed and to identify any potential impacts to surface water features. This is expected to include a combination of daily observations and monitoring using a calibrated, handheld water quality probe through the upstream and downstream of construction activities. It is expected that water quality sampling will be undertaken on a periodic as well as ad-hoc basis, dependent upon circumstances / activities onsite. Monitoring and sampling will be undertaken prior to the commencement of construction as to allow a sufficient baseline data to be collected.

11.10.2 Water quality monitoring in relation to sensitive watercourses, including chalk streams and Covenham Reservoir, should be subject to additional monitoring to ensure that there is no degradation in terms of water quality or flows.

11.11 Cumulative Effects

11.11.1 This section reports the findings of an assessment of potential intra-project and inter-project cumulative effects associated with the Proposed Development with a focus on how these effects may impact upon the water environment.

Assessment of Intra-Project Effects

11.11.2 There are potential intra-project effects on the water environment through multiple watercourses being crossed simultaneously in a catchment. Intra-project effects are not thought to be significant as the individual impacts will be treated at the source of impact and effects on water receptors will be mitigated via embedded mitigation and additional mitigation measures.

Assessment of Inter-Project Effects

11.11.3 The approach to cumulative assessment is set out in *Chapter 20: Cumulative Effects Assessment* of this ES.

11.11.4 Throughout the cumulative assessment, professional judgement using a reasonable worst-case scenario (considering standard practice mitigation which is assumed would be incorporated into the other schemes).

11.11.5 The Zone of Influence for cumulative effects extends 1 km around the DCO Boundary for the Water Environment. This allows all waterbodies which may be directly impacted by the Proposed Development to be identified and included. A viable pathway between source and receptor is less likely to be present over greater distances.

11.11.1 The full list of other developments with the potential for inter-projects impacts are detailed in *Chapter 20: Cumulative Effects Assessment*. The proposed/committed developments included on the shortlist extend within 1 km of the DCO Site Boundary, comprising the following.

Residential

- Peter Ward Homes – Brocklesby Avenue Habrough Road. Residential development for 145 dwellings with associated parking, landscaping, and emergency vehicular access only onto Mill Lane. This development is within the catchment of Harbrough Marsh Drain, and therefore hydrologically connected to the Proposed Development. Construction has commenced, however unsure when it will be completed.

- Brocklesby Estate – Residential Development on Land East of Stallingborough Road, Immingham. Outline planning application for the development of up to 525 residential dwellings together with an extra care facility for the elderly with up to 80 units. The development is located within the catchments of Immingham Pump Drain (not hydrologically connected to Proposed Development), and Harbrough Marsh Drain (hydrologically connected to Proposed Development). Construction has not commenced, however is due to be constructed soon.
- Humberside Land Developers Ltd - Residential Development in Laceby. Outline application for 152 dwellings with means of access to be considered, including an emergency vehicular access onto Charles Avenue. Within the catchment of a tributary of Laceby Beck, therefore hydrologically connected to the Proposed Development. Construction has not commenced, however is due to be constructed soon.
- Land Developers (LIncs) Ltd – Residential Development at Land off Field Head Road, Laceby. Erection of 60 dwellings including access from Fieldhead Road with emergency vehicular access onto Caistor Road and associated works Within the catchment of a tributary of Laceby Beck, therefore hydrologically connected to the Proposed Development. Construction has not commenced, however is due to be constructed soon.
- A hybrid application consisting of outline erection of up to 300 dwellings, located in Holton le Clay with means of access to be considered and full planning permission for change of use of land from agricultural land to a recreation ground. Located in the catchment of an unnamed drain that flows to the Humber Estuary, not hydrologically connected to the site.
- Cyden Homes – Residential development at Ludborough Road, North Thoresby. Application for the erection of 198no. dwellings with associated garages. Located within the catchments of Black Leg Drain and Bond Croft Drain, therefore hydrologically connected to the site. Currently not consented, therefore construction time unknown.

11.11.2 The construction of these has the potential for adverse effects on water quality due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals spilt on site. There is also potential for operational impacts on water quality due to additional runoff from development roads and additional traffic mobilising pollution on local roads, additional water needs and additional wastewater production. These projects will have to comply with national and local planning policy, and will include good practice mitigation measures and pollution prevention during construction, and therefore are unlikely to result in any significant cumulative effects. The Proposed Development will not have any significant effects on water quality, water usage or wastewater production. On this basis there are not considered to be any significant cumulative effects.

Energy Infrastructure Projects

- Orsted Gigastack Limited and Phillips 66 Limited – Gigastack Project. EIA Scoping request for a 100MV hydrogen electrolyser together with an underground electrical cable connection to the Hornsea Two onshore substation, water discharge and a hydrogen export pipeline to the Humber Refinery. Located within the catchment of South Killingholme Drain, therefore hydrologically connected to the Proposed Development. Currently awaiting scoping opinion, therefore construction date unknown.
- Planning permission to construct a new gas-fired power station with a gross electrical output of up to 49.9 megawatts. Located within the catchment of South Killingholme Drain, therefore hydrologically connected to the Proposed Development. Consented, however construction date unknown.

- Able UK Limited – Site Enabling Works, Land East of Rosper Road, Killingholme. The proposed development comprises regrading of land with general fill and raising site levels with imported fill, demolition of buildings, construction of new 33kV substation, diversion to existing Exolum underground pipeline, installation of ground drainage as required, and construction of new rail sidings. The works will include some instream works, including extending a drainage culvert, new ditch culvert under Marsh Lane, new drainage ditch/diversion and new ditch crossings. Located within the catchment of South Killingholme Drain, therefore hydrologically connected to the Proposed Development. Consent is pending approval and construction date unknown.
- Associated British Ports – Immingham Onshore Wind. EIA Scoping request for Immingham onshore wind including up to three wind turbines (Immingham Dock Western Entrance, Humber Road, South Killingholme).
- Associated British Ports – Immingham Onshore Wind. EIA Scoping request for Immingham onshore wind including up to three wind turbines (Land Along Tracks, West Haven Way, South Killingholme). Located within the catchment of South Killingholme Drain, therefore hydrologically connected to the Proposed Development. Consented, however construction date unknown.
- Able UK Limited - Monopole Manufacturing Facility at Land at Able Marine Energy Park, south of Station Road, South Humber Bank, South Killingholme. Planning permission to erect a monopole manufacturing facility to provide an offshore wind turbine monopile foundation manufacturing facility (‘the monopile factory’). The proposed development is a complex of large industrial steel-clad buildings used to manufacture monopiles for the offshore renewable energy sector. This development is approximately 25 ha in size. Located within the catchment of Marsh Drain, therefore not hydrologically connected to the site.

11.11.3 The construction of these has the potential for adverse effects on water quality due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals spilt on site. The operation of these may have effects on water availability and water quality due to operation. The timing of these developments may overlap with the construction of the Proposed Development, however the Proposed Development only has minor works within the South Killingholme Drain (IDB watercourse) catchment, and is assessed as having negligible effects on the watercourse for construction and operation. All Energy Infrastructure projects will include good practice pollution prevention measures and will ensure that there are no significant effects to the receiving waterbodies. On this basis there are not considered to be any significant cumulative effects.

Carbon Capture Projects

- VPI Immingham - VPI Immingham Pilot Carbon Capture Plant. Planning permission to construct and operate a temporary pilot post-combustion carbon capture plant and associated infrastructure. This is within the catchment of South Killingholme Drain. The project is approved and is likely to commence between now and 2025.
- Humber Zero: Phillips 66 Limited – P66 Carbon Capture Plant. Planning permission for the construction and operation of a post-combustion carbon capture plant, including carbon dioxide compression and metering, cooling equipment, stacks, substations, new and modified services, connections, internal roads, new access onto Eastfield Road, and maintenance and laydown areas (EIA development). This is within the catchment of South Killingholme Drain. The project is pending approval, however construction would like occur at a similar time to the Proposed Development.
- Humber Zero: VPI Immingham Carbon Capture Plant. Planning permission for the construction & operation of a post-combustion carbon capture plant, including carbon

dioxide compressor & metering, cooling equipment, stacks, substations, internal roads, partial realignment of South Killingholme Drain, new & modified services, connections, internal roads, accesses, maintenance & laydown areas. This is within the catchment of South Killingholme Drain. The project is pending approval, however construction would like occur at a similar time to the Proposed Development.

11.11.4 The construction of these has the potential for adverse effects on water quality due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals spilt on site. The timing of these developments are likely to overlap with the construction of the Proposed Development, however the Proposed Development only has minor works within the South Killingholme Drain (IDB watercourse) catchment, and is assessed as having negligible effects on the watercourse for construction and operation. All Carbon Capture projects will include good practice pollution prevention measures and will ensure that there are no significant effects to the receiving waterbodies. On this basis there are not considered to be any significant cumulative effects.

Solar Farms

- Grimsby Solar Farm – Aura Power. Install solar farm with associated works and infrastructure to include ground mounted solar panels, access tracks, inverters, transformers, storage units, substation compound, underground cables and conduits, temporary construction compound, perimeter fencing and planting scheme. Partially within the catchment of tributaries of Laceby Beck, therefore hydrologically connected to the Proposed Development. Construction anticipated to start in 2024.
- Engie - NEL Energy Park. Construction and operation of an energy park comprising photovoltaic (PV) solar panels together with energy (battery) storage and associated infrastructure. Within the catchment of a tributary of Laceby Beck, therefore hydrologically connected to the Proposed Development. Construction anticipated to commence soon or has recently begun.
- VEV Services Limited - Vitol (VPI Immingham). Planning permission for the installation of a 71.28 kwp solar carport and infrastructure for renewable energy generation. Located within the catchment of South Killingholme Drain.

11.11.5 The construction of these has the potential for some minor adverse effects on water quality due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals due to construction of roads and cable, and the operation will result in increased the hardstanding in the area. However, generally solar farms are low risk to the environment, and it is anticipated that the respective projects will provide appropriate mitigation to reduce the risk of any significant impacts, including respective surface water management strategies. The projects will have to comply with national and local planning policy and any specific conditions stipulated by statutory consultees. On this basis there are not considered to be any significant cumulative effects

General Infrastructure

- Associated British Ports (ABP) – Land Adjacent to the Westgate Entrance, Port of Immingham. A hybrid application comprising full planning permission for the development of land adjacent to the West Gate Entrance of the Port of Immingham for port related employment uses. Located within the catchment of South Killingholme Drain, application pending.

11.11.6 The construction of these has the potential for adverse effects on water quality due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals spilt on site. The timing of these developments may overlap with the construction of the Proposed Development, however the Proposed Development only has minor works within the South Killingholme Drain (IDB watercourse) catchment, and is assessed as having negligible

effects on the watercourse for construction and operation. On this basis there are not considered to be any significant cumulative effects.

- CHI Investments – The Willows. Construction of new foul sewer and associated works. Located within the catchment of Laceby Beck.

11.11.7 The construction of this has the potential for some minor adverse effects on water quality due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals, however given the small size of the works this is unlikely to result in significant cumulative effects, given the project will have to comply with national and local planning policy and any specific conditions stipulated by statutory consultees. On this basis there are not considered to be any significant cumulative effects.

Cumulative Effects Assessment Summary

11.11.8 There is likely to be overlap between construction and operation of several of these adjacent schemes and construction of the Proposed Development. Thus, there is the potential for short term, temporary construction related pollutants generated from both the Proposed Development and all of the above schemes to impact on watercourses in the study area (with watercourses affected included above). However, provided that standard and good practice mitigation is implemented on the above construction sites through their respective CEMPs and as per the conditions of the relevant planning permission, environmental permits and licences, as is being proposed for this development, the cumulative risk can be effectively managed and there would not be a significant increase in the risks to any water feature. As such, there would not be any additional cumulative impacts during construction on the basis of the above assessment.

11.12 Summary

11.12.1 There are a total of over 100 surface water features proposed to be crossed by the Proposed Development, which are a mixture of main river and Ordinary Watercourses, WFD designated, IDB maintained channels and minor drains. Natural England records also indicate three Chalk Streams within the study area.

11.12.2 The main potential impacts relating to construction include:

- increased surface water runoff and changes to existing runoff rates through increases in impermeable areas.
- temporary impacts to local hydromorphology due to watercourse crossings (open cut pipeline crossing and temporary haul roads)
- impacts to water quality from the mobilisation of fine sediment to water features effecting water quality through run off or scour,
- mobilisation of oils, cement or other chemicals effecting water quality,
- changes to the existing flow regime of watercourses as a result of crossings; and
- potential increase in flood risk elsewhere due to available compensatory floodplain storage is being displaced.

11.12.3 The main potential impacts relating to operation include increased surface water run off through increases in impermeable areas.

11.12.4 With the incorporation of embedded design mitigation and additional mitigation, the significance of residual effects for the Proposed Development on the water environment are defined as minor adverse to negligible and therefore not considered to be significant.

11.13 References

Ref 11-1 HMSO (1995) Environment Act 1995.

Ref 11-2 HMSO (1995) Environment Act 1995.

Ref 11-3 HMSO (2014) Water Act 2014.

Ref 11-4 HMSO (2010) Floods and Water Management Act 2010.

Ref 11-5 HMSO (1995) Environment Act 1995.

Ref 11-6 HMSO (1991) Land Drainage Act 1991 (as amended).

Ref 11-7 HMSO (1991) Water Resources Act 1991 (as amended).

Ref 11-8 HMSO (1975) Salmon and Freshwater Fisheries Act 1975 (as amended).

Ref 11-9 HMSO (1974) Control of Pollution Act 1974.

Ref 11-10 The Water Framework Directive (Standards and Classification) Directions 2017

Ref 11-11 HMSO (2018) Environmental Permitting (England and Wales) Regulations 2016 (as amended 2018).

Ref 11-12 HMSO (2017) Environmental Damage (Prevention and Remediation) Regulations 2017.

Ref 11-13 HMSO (2009) The Flood Risk (England and Wales) Regulations 2009.

Ref 11-14 HMSO (2009) Eels (England and Wales) Regulation 2009.

Ref 11-15 Environmental Protection, England And Wales. The Groundwater (England and Wales) Regulations 2009

Ref 11-16 HMSO (2002) The Control of Substances Hazardous to Human Health (COSHH) Regulations 2002.

Ref 11-17 HMSO (2001) Control of Pollution (Oil Storage) (England) Regulations 2001. Department of Energy and Climate Change (2011).

Ref 11-18 The Overarching NPS for Energy (EN-1). London: The Stationery Office.

Ref 11-19 BEIS (2021). Draft Overarching NPS for Energy (EN-1). Available at: *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1015233/en-1-draft-for-consultation.pdf*

Ref 11-20 Department of Energy and Climate Change (2011) National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipeline (EN-4). London: The Stationery Office

Ref 11-21 Department for Communities and Local Government (2023). National Planning Policy Framework. London. The Stationery Office. National Planning Policy Framework (publishing.service.gov.uk) Accessed 12/09/2023

Ref 11-22 Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government (2022) Planning Practice Guidance (PPG) Water supply, wastewater and water quality. Available at: *https://www.gov.uk/guidance/water-supply-wastewater-and-water-quality*

Ref 11-23 Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government (2022) Planning Practice Guidance (PPG)

Flood risk and coastal change. Available at: https://www.gov.uk/guidance/flood-risk-and-coastal-change

Ref 11-24 DEFRA (2018). A Green Future: Our 25 Year Plan to Improve the Environment. London: The Stationery Office

Ref 11-25 DEFRA (2023). Environmental Improvement Plan 2023

Ref 11-26 DEFRA (2011). Future Water: The Government's Water Strategy for England. London: The Stationery Office.

Ref 11-27 NELC (2018). North East Lincolnshire Council Local Plan [Online]. Available at: *http://www.nelincs.co.uk/wp-content/uploads/2018/05/20180518-AdoptedLocalPlan2018WEB.pdf*

Ref 11-28 ELC (2018). East Lindsey Council Local Plan [Online]. Available at:*https://www.elindsey.gov.uk/media/9791/CoreStrategy/pdf/Final_Version_of_Core_Strategy_2018.pdf?m=63682192273230000*

Ref 11-29 CLLP (2017). Central Lincolnshire Local Plan [Online]. Available at: *https://www.n-kesteven.gov.uk/central-lincolnshire//*

Ref 11-30 The Building Regulations 2010 Approved Document Part H: Drainage and Waste Disposal.

Ref 11-31 DEFRA (2015). Sustainable Drainage Systems: non-statutory technical standards. London: The Stationery Office.

Ref 11-32 CIRIA (2015). C753 The SuDS Manual. London: CIRIA.

Ref 11-33 National Highways (2021). CD 532 Vegetated drainage systems for highway runoff.

Ref 11-34 Highways Agency (2006). Design Manual for Roads and Bridges HD 33/16, Surface and Subsurface Drainage Systems for Highways. Birmingham: Highways Agency.

Ref 11-35 DMRB (2020) LA 113 - Road drainage and the water environment.

Ref 11-36 British Geology Survey (2020); Geoindex viewer, Available at: *https://mapapps2.bgs.ac.uk/geoindex/home.html* [Accessed: May 2023].

Ref 11-37 Cranfield University (2021). 'Soilscapes'. (Online) Available online: *http://www.landis.org.uk/soilscapes* [Accessed May 2023]

Ref 11-38 Defra, Multi-Agency geographical information for the countryside (MAGIC) map. Available at: *https://magic.defra.gov.uk/MagicMap.aspx* [Accessed May 2023]

Ref 11-39 East Lindsey Strategic Flood Risk Assessment 2017 (*https://www.elindsey.gov.uk/article/6200/Strategic-Flood-Risk-Assessment*) [accessed May 2023]

Ref 11-40 Environment Agency Catchment Data Explorer (*https://environment.data.gov.uk/catchment-planning*) [accessed May 2023]

Ref 11-41 Environment Agency Flood Map for Planning (*https://flood-map-forplanning.service.gov.uk/*) [accessed May 2023]

Ref 11-42 Environment Agency Statutory Main River Map (*https://environment.maps.arcgis.com/apps/webappviewer/*) [accessed May 2023]

Ref 11-43 Environment Agency Long Term flood risk map (Check for flooding in England GOV.UK (check-for-flooding.service.gov.uk) [accessed May 2023]

Ref 11-44 Natural England Designated Sites (*https://designatedsites.naturalengland.org.uk*/) [accessed May 2023]

Ref 11-45 Morton, R. D.; Marston, C. G.; O'Neil, A. W.; Rowland, C. S. (2020). Land Cover Map 2019 (20m classified pixels, GB). NERC Environmental Information Data Centre. *https://doi.org/10.5285/643eb5a9-9707-4fbb-ae76-e8e53271d1a0* [Accessed July 2023]

Ref 11-46 Met Office website. Available at: *https://www.metoffice.gov.uk/* [Accessed May 2023]

Ref 11-47 National River Flow Archive website. Available at: *https://nrfa.ceh.ac.uk/data* [Date Accessed May 2023]

Ref 11-48 North and North East Lincolnshire Strategic Flood Risk Assessment (2011) (SFRA) *https://www.nelincs.gov.uk/planning-and-building-control/planning-policy/the-localplan/local-plan-background-information/strategic-flood-risk-assessment-2011-sfra/ [accessed May 2023]*

Ref 11-49 Natural England Open Data Chalk Rivers (2023) [Accessed May 2023]. Available*: https://naturalengland-defra.opendata.arcgis.com/datasets/1bb8e710c8254e8fa33e95c7bc13229e_0/about*

Ref 11-50 Ordnance Survey maps. Available: https://www.bing.com/maps [Accessed: May 2023].

Ref 11-51 Environment Agency (2023) Asset Management Database. Accessed: 03/05/2023. Available: *https://environment.data.gov.uk/asset-management/index.html*

Ref 11-52 DEFRA, 2023 Recorded Flood Outlines. [Accessed: July 2023]. Available at: *https://environment.data.gov.uk/dataset/8c75e700-d465-11e4-8b5b-f0def148f590*

Ref 11-53 AECOM (2022) Viking CCS Pipeline PEIR Vol II Chapter 11 Water Environment

Ref 11-54 Environment Agency (2022) River basin management plans: updated 2022

VikingCCS

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