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Humber H2ub® (Green) – Environmental Impact Assessment Scoping Report

Uniper Hydrogen UK

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Abbreviations & Nomenclature

AADT	Annual Average Daily Traffic
ABP	Associated British Ports
AC	Alternating Current
ADMS	Atmospheric Dispersion Modelling System
AEP	Annual Exceedance Probability
AGI	Above Ground Installation
ALARP	As Low As Reasonably Practicable
AOD	Above Ordnance Datum
APIS	Air Pollution Information System
AQMA	Air Quality Management Area
AQS	Air Quality Standard
ATC	Automatic Traffic Counter
BAT	Best Available Technique
BEIS	Department of Business, Energy & Industrial Strategy
bgl	below ground level
BGS	British Geological Survey
BNG	Biodiversity Net Gain
BREF	BAT Reference document
CAA	Civil Aviation Authority
CBM	Ceramic Building Material
CCGT	Combined-Cycle Gas Turbine
CCRA	Climate Change Resilience Assessment
CCS	Carbon Capture and Storage

CCUS	Carbon Capture, Usage and Storage
CDM	Construction, Design and Management
CEMP	Construction Environmental Management Plan
CERC	Cambridge Environmental Research Consultants
CIEEM	Chartered Institute of Ecology and Environmental Management
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COMAH	Control Of Major Accident Hazards
CoPA	Control of Pollution Act
CRTN	Construction of Road Traffic Noise
CSM	Conceptual Site Model
CWS	County Wildlife Site
DCO	Development Consent Order
DEFRA	Department for Environment, Food and Rural Affairs
DESNZ	Department for Energy Security and Net Zero (formerly BEIS)
DMRB	Design Manual for Roads and Bridges
DPD	Development Plan Document
DQRA	Detailed Quantitative Risk Assessment
EA	Environment Agency
EAL	Environmental Assessment Level
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
EPUK	Environmental Protection UK
ES	Environmental Statement
EU	European Union

FEED	Front End Engineering and Design
FEH	Flood Estimation Handbook
FRA	Flood Risk Assessment
FRA	Flood Risk Assessment
GHG	Greenhouse Gas
GIS	Geographic Information System
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GQRA	Generic Quantitative Risk Assessment
GVA	Gross Value Added
H^+	Hydrogen Ion
HAZID	Hazard Identification
HER	Historic Environment Record
HGV	Heavy Goods Vehicle
HPF	Hydrogen Production Facility
HSE	Health and Safety Executive
HV	High Voltage
IAQM	Institute of Air Quality Management
ICCI	In-Combination Climate Impact
IED	Industrial Emissions Directive
IEMA	Institute of Environmental Management and Assessment
KOH	Potassium hydroxide
KPS-B	Killingholme B Power station
LAQM	Local Air Quality Management
LCRM	Land Contamination Risk Management
LDF	Local Development Framework

LHV	Lower Heating Value
LLFA	Lead Local Flood Authority
LNG	Liquefied Natural Gas
LPA	Local Planning Authority
LVIA	Landscape & Visual Impact Assessment
LWS	Local Wildlife Site
MA&D	Major Accidents & Disasters
MCPD	Medium Combustion Plant Directive
MMC	Manual Classified Count
MMP	Material Management Plan
MPS	Marine Policy Statement
NCA	National Character Area
NCN	National Cycle Network
NELC	North East Lincolnshire Council
NH_3	Ammonia
NHLE	National Heritage List for England
NLC	North Lincolnshire Council
NLHER	North Lincolnshire Historic Environment Record
NNEL SFRA	North East Lincolnshire Strategic Flood Risk Assessment
NNR	National Nature Reserve
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
NPPF	National Planning Policy Framework
NPS	National Planning Statement
NPSE	Noise Policy Statement for England

NRMM	Non-Road Mobile Machinery
NSIP	Nationally Significant Infrastructure Project
NSR	Noise Sensitive Receptor
OCGT	Open-Cycle Gas Turbine
OH^-	Hydroxide Ion
ONS	Office for National Statistics
P66	Phillips 66 Limited
PDU	Purification and Drying Unit
PEM	Proton Exchange Membrane
PM_{10}	Particulate matter with diameter of less than 10 microns
$PM_{2.5}$	Particulate matter with diameter of less than 2.5 microns
PPA	Power Purchase Agreement
PPG-N	Planning Practice Guidance – Noise
PRoW	Public Rights of Way
RBMP	River Basin Management Plans
RPG	Registered Park and Garden
RPZ	Root Protection Zone
SAC	Special Area of Conservation
SCAIL	Simple Calculation of Atmospheric Impact Limits
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage System
SWMP	Site Waste Management Plan
TCPA	Town and Country Planning Act

UNFCCC	United Nations Framework Convention on Climate Change
UPW	Ultra Pure Water
UTL	Uniper Technologies Ltd
WFD	Water Framework Directive
WTP	Water Treatment Plant
ZTV	Zone of Theoretical Visibility

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1 INTRODUCTION

1.1 Project Introduction and Context

1.1.1 This Environmental Impact Assessment (EIA) Scoping Report has been prepared by Uniper Technologies Ltd (UTL) to provide the information necessary to allow the relevant planning authority, North Lincolnshire Council (NLC), to adopt a Scoping Opinion in relation to assessments to be provided within the Environmental Statement (ES) for the 'Humber H_2ub® (Green) Project' (henceforth the 'Proposed Development') being developed by Uniper Hydrogen UK Ltd (the 'Applicant') at Killingholme, North Lincolnshire.

1.1.2 The Proposed Development will include green hydrogen production capability with a capacity of up to 120 MW* and potential future expansion of a further 200 MW+. The hydrogen would be used to replace refinery fuel gas in industrial-scale fired heaters as part of Phillips 66 Limited's (P66's) plans to reduce the Humber Refinery's scope 1 operational emissions. P66's Humber Refinery is located approximately 4 km to the south of HPF.

1.1.3 Low carbon hydrogen produced by electrolysis has to meet the UK Low Carbon Hydrogen Standard [1]. The electricity for the Proposed Development could come from a range of sources; future on-site development, renewable generation, as well as low carbon power generation, either directly connected to the electrolyser or via the national grid, enabled by power purchase agreements and renewable guarantees of origin.

1.1.4 The best solution for delivering the hydrogen produced by the Proposed Development to P66 will be determined during Front End Engineering Design (FEED) studies, which are due to take place from 2025. However, it is anticipated that the hydrogen will be delivered initially via a dedicated pipeline.

1.1.5 It is currently assumed that there will be no separate storage of hydrogen within the Proposed Development, although this could change as commercial terms are negotiated and technical requirements develop. Any such changes will be stated and assessed within the ES.

1.1.6 This report includes the necessary information for NLC to adopt a Scoping Opinion under Regulation 15 of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations), part of the process of undertaking an EIA. It is considered the Proposed Development falls within the scope of Schedule 1 of the EIA Regulations and further details on this are provided in Section 1.4.

* The final plant capacity is dependent upon the electrolyser supplier selected and the reliability/availability studies that will be completed during Front End Engineering Design (FEED), due to take place from 2025.

1.2 The Applicant

1.2.1 The Applicant, Uniper Hydrogen UK Ltd, is a subsidiary of Uniper Hydrogen GmbH, which is itself part of Uniper SE (henceforth 'Uniper').

1.2.2 Düsseldorf-based Uniper is an international energy company with activities in more than 40 countries. The company and its roughly 7,000 employees make an important contribution to supply security in Europe, particularly in its core markets of Germany, the United Kingdom, Sweden, and the Netherlands.

1.2.3 Uniper's operations encompass power generation in Europe, global energy trading, and a broad gas portfolio. Uniper procures gas—including liquefied natural gas (LNG)—and other energy sources on global markets. The company owns and operates gas storage facilities with a total capacity of more than 7 billion cubic meters.

1.2.4 Uniper intends to be completely carbon-neutral by 2040. Uniper aims for its installed power generating capacity to be more than 80% zero-carbon by 2030. To achieve this, the company is transforming its power plants and facilities and investing in flexible, dispatchable power generating units. Uniper is already one of Europe's largest operators of hydropower plants and is helping further expand solar and wind power, which are essential for a more sustainable and secure future. The company is progressively expanding its gas portfolio to include green gases like hydrogen and biomethane and aims to convert to these gases over the long term.

1.2.5 Uniper is a reliable partner for communities, municipal utilities, and industrial enterprises for planning and implementing innovative, lower-carbon solutions on their decarbonization journey. Uniper is a hydrogen pioneer, is active worldwide along the entire hydrogen value chain, and is conducting projects to make hydrogen a mainstay of the energy supply.

1.2.6 In the UK, Uniper owns and operates a flexible generation portfolio of seven power stations, a fast-cycle gas storage facility and two high pressure gas pipelines, from Theddlethorpe to Killingholme and from Blyborough to Cottam. It also has significant long-term regasification capacity at the Grain Liquefied Natural Gas (LNG) terminal in Kent, which converts LNG back to natural gas.

1.3 The EIA Team

1.3.1 The Humber H_2ub® (Green) Project EIA is being co-ordinated by UTL for the Applicant. UTL is the lead consultant and principal author of this EIA Scoping Report and will fulfil the same role for the ES that will accompany the planning application. UTL have extensive experience in relation to the preparation of planning applications and EIAs for energy projects.

1.3.2 The ES chapters and assessments will be completed by a team of specialist consultants from UTL and a range of experienced companies. The team comprises of:

- Allen Archaeology – Cultural Heritage Assessment
- Aspect Ecology – Terrestrial Ecology Assessment
- RSK – Traffic and Transport, and Landscape and Visual Impact Assessments.

- UTL – Air Quality and Human Health, Water Quality, Material and Waste Management, Climate Change, Noise and Vibration, Ground Conditions, Major Accidents and Disasters, and Socio-economics Assessments.

1.4 Requirement for EIA

1.4.1 Planning consent for the Proposed Development is to be sought via a planning application under the Town and Country Planning Act 1990 (as amended). As part of the planning application, the requirement for an EIA is enacted into law by the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations'). EIA is a legally required process examining the likely significant effects of the construction, operation and decommissioning of a proposed development.

1.4.2 Developments which require an EIA are referenced within Schedules 1 and 2 of the EIA Regulations. An EIA is mandatory for Schedule 1 developments, whilst Schedule 2 developments may require an assessment if there is potential that the development may have significant environmental impacts.

1.4.3 Within the current EIA Regulations, the Proposed Development falls within Schedule 1 Part 6(b) covering "Integrated chemical installations, that is to say, installations for the manufacture on an industrial scale of substances using chemical conversion processes, in which several units are juxtaposed and are functionally linked to one another and which are for the production of basic inorganic chemicals". Therefore an ES is required to be submitted alongside a planning application for this development.

1.5 Purpose of Scoping

1.5.1 The overall EIA process aims to protect the environment by identifying and assessing the potential for likely significant effects on the environment that the Proposed Development may have. The ES is the end result of the EIA process and will assist NLC in deciding whether to grant planning permission for the Proposed Development.

1.5.2 EIA scoping determines the relevance and extent of environmental factors to be assessed within the ES, as well as the methods of assessment. Potential impacts from the construction, operation and future decommissioning of the Proposed Development are considered.

1.5.3 Regulation 15(2) of the EIA Regulations requires the following information to be included in this EIA Scoping Report:

- a plan sufficient to identify the land;
- a brief description of the nature and purpose of the development, including its location and technical capacity;
- an explanation of the likely significant effects of the development on the environment; and
- such other information or representations as the person making the request may wish to provide or make.

1.5.4 This EIA Scoping Report is being submitted to NLC for a 'Scoping Opinion'. The Scoping Opinion will be used to confirm the focus of the ES, and that appropriate mitigation and enhancement

measures are considered, as well as providing clarification on what the local planning authority (LPA) deems likely to be the main environmental factors.

1.5.5 The focus of the ES will continue to be refined through the evolution of the project, collection of baseline data and consultation with stakeholders. This ensures the extent of research is appropriate to the magnitude and significance of the environmental impacts as they are established.

1.6 Summary of Engagement

1.6.1 Preliminary Consultations have begun with relevant regulatory bodies and stakeholders ahead of the planning application submission. A summary of the engagement with these consultees is documented in Table 1-1 below and will be continued to be updated in the forthcoming ES documents as further consultations are held.

Table 1-1 Summary of Engagement

Consultee	Date and Type of Engagement	Summary
North Lincolnshire Council	21/03/2022 (letter via email)	Submission of the Pre-Application form, site plan, and briefing note for the Humber H2ub® projects (Blue and Green)
North Lincolnshire Council	28/04/2022 (online meeting)	Pre-Application Advice discussion, presenting the project information and planning approach.
North Lincolnshire Council	13/06/2022 (letters via email)	Pre-Application Advice documents received. NLC concluded that the proposal accords with the relevant Development Plan policies and that the principle of development is acceptable subject to an assessment of the potential environmental impacts of the developments.
Environment Agency (EA)	20/02/2024 (In-person meeting on Site)	Meeting with the EA site inspector and members of the Energy Industries Decarbonisation team. Attendees were introduced to the Humber H_2ub® projects at the Killingholme site, including the scope and timeline of the green hydrogen project.
South Killingholme Parish Council Meeting	01/07/2024 (In-person meeting at South Killingholme Community Centre	Briefing meeting with members of the Parish Council to introduce the Humber H_2ub® (Green) Project.
North Killingholme Parish Council Meeting	23/07/2024 (In-person meeting at North Killingholme Village Hall	Briefing meeting with members of the Parish Council to introduce the Humber H_2ub® (Green) Project.

1.7 Structure of the EIA Scoping Report

1.7.1 Beyond this introduction the remainder of this report is structured as follows:

- Section 2 describes the Proposed Development
- Section 3 outlines the principles of the EIA methodology
- Section 4 identifies national and local planning policy
- Section 5 describes the planned consenting route
- Sections 6 – 17 cover the environmental factors which will be included in the EIA
- Section 18 covers the environmental factors which have been scoped out
- Section 19 provides a summary table of the potential effects which have been scoped in and out in relation to the environmental factors covered in sections 6 – 17
- Section 20 provides the structure of the overall ES
- Appendix A includes Figures referenced throughout the EIA Scoping Report

2 PROPOSED DEVELOPMENT

2.1 Site Location

2.1.1 The Proposed Development is located in Immingham, North Lincolnshire, with the green HPF located within the same landholding as the existing Killingholme B power station (KPS-B) which is owned and operated by Uniper. KPS-B was first commissioned in 1992 as a gas-fired Combined-Cycle Gas Turbine (CCGT) plant before being converted to an Open-Cycle Gas Turbine (OCGT) plant in 2016. KPS-B is capable of providing 600 MW of electrical power and will remain operational for the foreseeable future. Uniper also operates two synchronous condenser units on the KPS-B site which came into commercial operation in the second quarter of 2022.

2.1.2 The Proposed Development (including the green HPF and associated utilities (the “Main Site”)) are located within the current Uniper landholding, as shown in Map 2-1. The Main Site lies approximately 1.5 km east of East Halton, 2 km north east of North Killingholme, and 1.5 km west of the southern bank of the River Humber. It is located in North Lincolnshire District and North Killingholme Parish. It is centred on National Grid Reference TA 15513 19000.

2.1.3 The Proposed Development is located in a largely industrial area, with large scale buildings associated with the existing power station, the National Grid Substation bordering the Main Site and Hornsea Offshore Windfarm Onshore Substation located to the north. To the south of the Site is Chase Hill Road which runs east to west, beyond which is the Prax Lindsey Oil Refinery and the Philips 66 Humber Refinery. The nearest residential property to the Main Site is Fairfields on Brick Lane located 1 km west-southwest of the centre of the application area.

2.2 Pipeline Routing

2.2.1 The Proposed Development will include newly constructed hydrogen export and refinery effluent water import pipelines. The extent of the pipeline route which forms part of the planning application will be between the Main Site and the pipeline interface area, which is likely to be an above ground installation (AGI) to be located outside of the fence boundary of the P66 Humber Refinery.

2.2.2 There are several route options for the pipelines currently under consideration, with a final route selection to be made before the submission of the final planning application. This EIA Scoping Report is based on the indicative pipeline routes shown in Map 2-2. If the final route selected has significant deviations from the indicative pipeline routes presented in this report, the scope of the environmental assessments will be adjusted to accurately assess the final route, in discussion with NLC.

2.2.3 Development of pipeline infrastructure connecting the P66 Humber Refinery to the pipeline interface area does not form part of this planning application and is therefore outside of the scope of the Proposed Development.

2.2.4 P66 will develop the connecting infrastructure to transport the hydrogen from the pipeline interface area to within the Humber Refinery and to transport refinery effluent water from the Humber Refinery to the pipeline interface area. P66 will manage any modifications to the refinery effluent storage and distribution system, hydrogen distribution system, and any associated

planning permissions, if any are required to connect the Humber Refinery to the pipeline interface area.

2.3 Technical Overview

2.3.1 The Proposed Development is a green HPF which will split water into oxygen and hydrogen using renewable electricity, the auxiliaries systems required to serve the HPF, as well as pipelines that will connect the HPF to an above ground P66 pipeline interface area, exporting hydrogen and importing refinery effluent water.

2.3.2 The HPF will consist of number of individual electrolyser units with a capacity of up to 120 MW that will produce a total of 21,000 Nm^3/h of low-carbon hydrogen using renewable electricity to split water that is anticipated to be produced from treated P66 refinery effluent water.

2.3.3 The 21,000 Nm^3/h of hydrogen produced will need to be of combustion quality in order to be used to enable fuel switching from refinery fuel gas in various fired heaters within the P66 Humber Refinery. The fuel switching from the volume of refinery fuel gas equivalent to 21,000 Nm^3/h of low carbon hydrogen will contribute to a saving of around 100,000 tonnes of CO_2 a year, as part of wider plans to reduce Scope 1 emissions at the Humber Refinery.

2.3.4 The HPF will be designed to have 97% availability so as to allow for unplanned maintenance. Planned maintenance will be aligned with refinery outages.

2.3.5 The design of the Proposed Development is not yet fixed, with a competitive tender process underway to select a design to be taken forward into front end engineering and design (FEED). As the EIA will be undertaken alongside the competitive tender and FEED processes, the Rochdale Envelope approach will be followed to ensure that where alternatives in layout, and design parameters appear, the worst-case option is considered within the EIA. The optionality of the design and layout of the Proposed Development will be reduced ahead of the submission of the ES and the final application boundary will be confirmed and assessed against accordingly.

2.4 Hydrogen Production Process

2.4.1 The following section describes the process through which low carbon hydrogen will be produced by the Proposed Development.

2.4.2 The HPF will use a number of electrolyser units to split demineralised water into hydrogen and oxygen using low carbon electricity. The two electrolyser technology options under consideration are proton-exchange membrane (PEM) and pressurised alkaline water electrolysis.

2.4.3 In PEM electrolysis water is split into oxygen and hydrogen ions (H^+) at the positive electrode (anode), the H^+ ions pass through a membrane to the negative electrode (cathode) where hydrogen is generated.

2.4.4 In alkaline water electrolysis water is split into hydrogen and hydroxide ions (OH^-) at the cathode, the OH^- ions diffuse through a liquid electrolyte of potassium hydroxide (KOH) to the anode, where the ions generate oxygen.

2.4.5 Dependent on the final technology selection, hydrogen is anticipated to be generated at a pressure of approximately 30 to 40 bar. No further compression of the hydrogen is planned. The generated hydrogen will be saturated with water and trace oxygen, and require processing within purification and drying units (PDUs). The purified hydrogen will be metered at the Main Site before delivery to P66 interface area.

2.4.6 Uniper currently has no off-taker for oxygen. Therefore all oxygen generated will be safely vented to atmosphere through a dedicated oxygen vent.

2.4.7 A dedicated hydrogen vent is included with the Proposed Development to allow for hydrogen venting during purging of the HPF. Oxygen and hydrogen vent dispersion studies will be conducted to determine safe height and location of the vent stacks.

2.4.8 A configuration of an alkaline water electrolysis HPF is shown in in Figure 2-1 below.

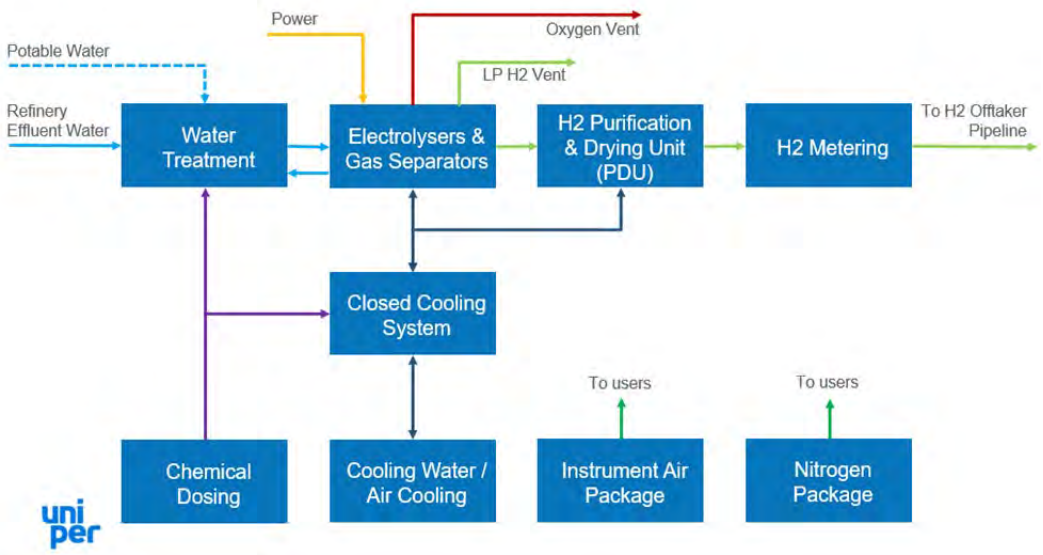


Figure 2-1 Block Flow Diagram of an Alkaline Water Electrolysis HPF

2.5 Utilities

2.5.1 Low carbon hydrogen produced by electrolysis has to meet the UK Low Carbon Hydrogen Standard. The electricity for the Humber H_2ub® (Green) hydrogen project could come from a range of sources; future on-site development, renewable generation, as well as low carbon power generation, either directly connected to the electrolyser or via the national grid, enabled by power purchase agreements and renewable guarantees of origin.

2.5.2 The primary water source for the electrolysers will be refinery effluent water from the P66 Humber Refinery. The refinery effluent water will be treated to the required quality to supply the electrolyser modules at a purpose-built water treatment plant (WTP) that will be part of the Proposed Development. The refinery effluent water will be delivered to a raw water break tank via pipeline. Any modifications required to the refinery effluent water distribution system to supply the effluent water to the pipeline interface area will be managed by P66 and will not form part of the planning application for the Proposed Development.

2.5.3 A back-up water supply will be included within the Proposed Development. The current assumption is that back-up water source is likely to be non-potable water supplied by Anglian Water. The non-potable water will only be used if the P66 refinery effluent water supply is unavailable.

2.5.4 To produce up to 21,000 Nm^3/h of hydrogen, the HPF will require approximately 20 m^3/h of demineralised water. The required flowrate of refinery effluent water to meet this demand is anticipated to be approximately 32 m^3/h.

2.5.5 Storage tanks for the demineralised water and wastewater produced by the WTP will be part of the Proposed Development. Wastewater will be discharged to the Humber Estuary via the existing Killingholme Power Station outfall and the quality of the discharge will be in line with an environmental permit that will be subject to a separate application to the Environment Agency.

2.5.6 If pressurised alkaline water electrolysers are the selected technology, a KOH filling and drainage system, with small storage tanks will be included in the green HPF. The tanks will be sized to enable two electrolyser units to be filled with new KOH and two electrolysers to be drained, simultaneously. Any waste KOH is expected to be tankered off site for treatment and disposal or further use.

2.6 Key Development Components

2.6.1 Major equipment included directly within the HPF will consist of:

- Electrolyser arrays; including rectifiers, liquid skids, gas skids, gas separators and media skids.
- Hydrogen PDUs – redundancy provided by 100% x 2 capacity.
- Air cooling system.
- Hydrogen and oxygen vent stacks – height to be determined by dispersion modelling.
- Instrument air, nitrogen and KOH systems.
- Hydrogen metering.
- Associated pipework, heat exchangers and other miscellaneous equipment.

2.6.2 Other key components likely to be included within the Proposed Development consist of:

- Water Treatment Plant.
- The existing Killingholme purge pipeline and outfall.
- Chemical loading and storage facilities.
- HV transformers and switchgear.
- Control room and offices.
- Workshops and equipment store.
- Internal access roads.
- Start-up equipment.
- Surface water drainage system.

2.6.3 During construction, contractor welfare facilities and construction laydown areas will be provided. Detail on the location of laydown areas will be confirmed as part of the planning application submission.

2.6.4 The heights and location of the vent stacks from the HPF will be determined by the results of air dispersion modelling in order to ensure that the Proposed Development is compliant with all relevant safety and environmental standards.

2.7 Design Legislation

2.7.1 The Proposed Development will be designed in line with relevant legislation, standards and guidance. Whilst enacted legislation and standards specific to green hydrogen developments are currently limited, guidance and legislation covering similar sectors will be considered. The Proposed Development design will incorporate embedded mitigation to meet the following legislation and guidance, as applicable:

- The Waste Regulations 2011
- The Environmental Permitting Regulations 2016 (as amended)
- The Water Environment (Water Framework Directive) Regulation 2017
- The Industrial Emissions Directive (Directive 2010/75/EU)
- The UK Low Carbon Hydrogen Standard (Version 3) [1]
- EA guidance on ‘Hydrogen production by electrolysis of water: emerging techniques’ [2]
- BAT Reference (BREF) for ‘the Production of Chlor-alkali’ [3]
- EU Ambient Air Quality Directive and UK Air Quality Strategy Objectives

2.8 Construction and Commissioning

2.8.1 The Main Site can be accessed by the existing access road off Chase Hill Road, which is shared with the existing operational OCGT plant, or alternatively the existing access road to the National Grid 400 kV substation off of Chase Hill Road may be modified to provide additional access. With the proximity of the Port of Immingham to the south east of the development site, some plant and equipment may be delivered by sea and so alleviate some traffic on the wider road network. Access to the pipeline routes will be dependent on the finalised route.

2.8.2 Based on the current project timeline, construction of the Proposed Development could commence as early Q1 2026. As construction and commissioning are expected to take approximately 36 months, the Proposed Development could be operational and ready to deliver hydrogen to P66 Humber Refinery by early 2029.

2.8.3 The ES will include further detail on the proposed program of construction activities, their expected duration, details of any temporary work shelters and include the effects of such works within the relevant environmental assessments. A Construction Environmental Management Plan (CEMP) will be finalised following approval of planning permission, with the conditions attached to the planning consent expected to determine the information required within the CEMP.

2.8.4 The CEMP will provide the measures to monitor and control environmental impacts throughout the construction phase, ensuring that environmental impacts from construction activities are correctly managed.

2.9 Operation

2.9.1 The Proposed Development is anticipated to be operational by early 2029, in order to align with P66's current schedule to begin substituting refinery fuel gas in industrial heaters at the Humber Refinery.

2.9.2 As the heaters are needed to support core refinery operations, a "base load" hydrogen supply is required and the HPF design will be specified to have a minimum availability of 97% (excluding planned maintenance periods).

2.9.3 The number of operation staff that will be required onsite will be estimated following FEED evaluation. The extent of impacts from operational activities will be assessed within the ES.

2.10 Decommissioning

2.10.1 The Proposed Development is expected to have a lifetime of 25 years. Towards the end of operation it is expected that an assessment will be made, based on the market conditions at the time, as to whether it is financially viable and appropriate to extend the operational lifetime. At the end of its operational life, the most likely scenario is that the Proposed Development would be shut down and all above ground structures removed from the Site. The Site would then be suitably remediated as required in discussion with NLC. These activities would be preceded by the development of a decommissioning plan agreed with the EA as part of the environmental permit surrender process. A Decommissioning Environmental Management Plan would consider in detail all potential environmental risks of the decommissioning activities and contain guidance on how risks can be removed or mitigated during the decommissioning and demolition. The need for an EIA relating to demolition would be assessed in consultation with NLC and it is proposed that the decommissioning phase will not be covered in detail within the ES.

2.10.2 The decommissioning phase is expected to begin over 25 years from the production and publication of the ES for the Proposed Development. Based on the Applicant's experience in decommissioning and demolition projects both at the KPS-B and other sites in the UK, it is assumed that the environmental effects that may occur during the decommissioning will be no worse than those relating to the construction phase.

3 EIA METHODOLOGY

3.1 Introduction

3.1.1 This section describes the approach that will be taken to complete the EIA for the Proposed Development. The specific process taken to complete the assessment of each environmental factor will be detailed within the respective chapter. All assessments will be carried out in line with Schedule 4 of the EIA Regulations and follow a similar approach that includes:

- an introduction that describes the basic premise of the chapter and the approach to the assessment, including the professional competence of the person(s) undertaking the assessment;
- a description of the assessment methodology, including the type of survey or modelling completed, the criteria used to define the impacts, as well as the limitations of the assessment and the guidance and standard practices followed;
- an assessment of the baseline conditions regarding that environmental factor, also taking into account any changes that may occur to the baseline with time, excluding the influence from the Proposed Development;
- an impact assessment that describes the potential effects of the Proposed Development, where the final description of the impact will be determined by the extent and significance of the effect, taking into account any mitigation measures that have been incorporated within the Proposed Development design;
- a description of the mitigation measures that will be incorporated to reduce the impact of any effects described within the impact assessment; and
- a conclusion summarising the findings of the assessment, including any residual impacts still likely post-mitigation and any cumulative effects with other proposals that are known in the area.

3.2 Baseline for Assessment

3.2.1 Paragraph 3 of Schedule 4 of the EIA regulations requires a description of the “current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge”. Therefore baseline assessments will be established from a combination of site visits/surveys, desk based studies and modelling. The extent of the study area used in the assessment of each environmental factor will also be described and justified.

3.3 Determination of Significance

3.3.1 Each assessment will describe the likely environmental impacts from both the construction and operation phases of the Proposed Development on the respective baseline scenario. The assessment will include a description of the nature, extent and significance of the effects, taking into account any mitigation measures already designed into the Proposed Development.

3.3.2 Each assessment will use methods of determining significance specific to the relevant environmental factor. As the EIA Regulations do not provide defined approaches to the

assessment of significance, the assessments will follow methodologies and criteria set out by relevant professional institutions. When such information is not available, technical specialists will develop the assessment criteria using industry best practice and professional judgement to enable a definitive assessment to be conducted.

3.3.3 The nature of the impact is derived from multi-criteria analysis which considers the magnitude of the impact and the sensitivity of the receptor which is affected. Several factors are taken into account to determine the type and magnitude of the impact, as follows:

- The timing of the impact (e.g. time of day/year)
- The duration of the impact (e.g. temporary or permanent)
- The geographic scale of the impact (e.g. localised or widespread)
- Whether the impact is reversible
- The likelihood of the impact occurring
- Whether the impact is adverse or beneficial

3.3.4 Several factors are also taken into account to determine the sensitivity of a receptor such as:

- Existing regulations and designation status
- Proximity to the site
- The receptor quality
- The rarity of the receptor
- The ability of the receptor to adapt to the change

3.3.5 The tiers of the magnitude and sensitivity that are determined and defined for each environmental factor will then be used to define the level of effect. Where appropriate, assessments will use a matrix such as the example shown by Table 3 1 below.

Table 3-1 An Example of a Level of Effect Matrix

		Magnitude of Impact			
		High	**Medium**	**Low**	**Negligible**
Sensitivity of Receptor	**High**	Major	Major to Moderate	Moderate	Minor or Negligible
	Medium	Major to Moderate	Moderate	Moderate to Minor	Negligible
	Low	Moderate	Moderate to Minor	Minor	Negligible
	Negligible	Minor or Negligible	Negligible	Negligible	Negligible

3.3.6 Where the use of a matrix is not appropriate, the level of effect will be determined using professional judgement. From the level of effect a determination as to whether or not an impact is significant or not significant will be made. When necessary, other environmental impact assessment approaches may be used to determine the potential impacts of a relevant chapter.

3.3.7 There is no statutory definition for which levels of effect should be considered significant, nor is there is a singular definitive answer for what is a significant impact. Therefore, an impact will be deemed significant if it is likely to be a material factor which may impact a decision made by the final decision-maker or relevant consultees. Hence, all potential impacts will be assessed and described clearly to allow relevant parties to make well-informed judgements.

3.3.8 Each assessment will clearly state where an impact is considered to be significant, with the determination based on professional judgement. Where a matrix is used, all major impacts and some moderate impacts will be considered significant with professional judgement once again determining which moderate impacts are likely to be significant.

3.4 Mitigation

3.4.1 Paragraph 7 of Schedule 4 of the EIA Regulations requires “a description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements” covering both the construction and operational phases. Mitigation measures are specific to the environmental factor and the nature of the effect. The approach taken to mitigation will follow the hierarchy below:

1. Avoid
2. Reduce
3. Remediate
4. Offset

3.4.2 Mitigation measures may already be incorporated within the design of the Proposed Development. Where this is the case, these measures will be clearly described within the ES. The mitigation section will cover additional mitigation measures proposed to avoid, reduce, remediate or offset any adverse effects resulting from the development design. A description of the mitigation measure and an explanation of how the measure will mitigate/reduce the relevant effect will be included.

3.5 Residual Effects

3.5.1 Residual effects are those which still remain following the implementation of any suggested mitigation measures. All reasonable efforts will be made to ensure residual effects are not significant and the conclusion will clearly identify any areas where the Proposed Development is likely to result in significant environmental effects.

3.6 Cumulative Effects and Human Health Impacts

3.6.1 Any cumulative effects will also be covered within the conclusion of each assessment. Paragraph 5(e) of Schedule 4 of the EIA Regulations requires that significant effects resulting from "*the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources*". Although the regulations only specify that cumulative effects from existing/approved projects require consideration, it is proposed to include the cumulative effects from any projects currently awaiting planning decisions. This is due to the potential that several developments associated with the decarbonisation of the region may be planned and the possibility that these projects could be granted approval ahead of the Proposed Development.

3.6.2 As existing projects in the area will already have an influence on the environment, this will be accounted for when assessing the baseline conditions for the non-cumulative assessment for each environmental factor. Therefore the additional projects that would form the assessment of significant cumulative effects are proposed to be limited to major projects that have been granted consent but have not been constructed and those which have been submitted and are awaiting planning approval. Major projects will be defined as developments with a floor space of 10,000 m^2 or greater and requiring an EIA. Projects outside of this definition will not be included unless specifically requested by NLC. To complete such an assessment, information about the additional projects would need to be publicly available, therefore an ES supporting the planning application for such projects would need to be available.

3.6.3 From an initial search of planning applications in North Lincolnshire, the following planned developments which may need to be considered in combination with the Proposed Development have been identified:

- Able Monopile Manufacturing Facility PA/2021/1525 (NLC)
- VPI Immingham and Phillips 66 Post-Combustion Carbon Capture developments PA/2023/421 and PA/2023/422 (NLC)
- Site Enabling Works, Land East of Rosper Road, Killingholme PA/2023/502 (NLC)
- Port of Immingham Wind Turbines PA/2024/397 (NLC)
- Humber Tech Park Data Centre PA/2024/584 (NLC)
- Able Marine Energy Park (Development Consent Order (DCO)
- North Killingholme Power Project (DCO)
- VPI Immingham OCGT (DCO)
- Viking CCS Pipeline Project (DCO)

3.6.4 Each environmental factor will have a different sized study area in which potential effects could occur. Within each environmental factor, professional judgement will be used to recommend an appropriately sized search area to capture potential cumulative effects for the EIA.

3.6.5 If either cumulative effects or human health impacts (or both) are considered relevant to an environmental factor they will be considered within the individual factor chapters, with any consideration being identified within the chapter introduction.

4 PLANNING POLICY

4.1 National Planning Policy Framework

4.1.1 The National Planning Policy Framework (NPPF) published by the Ministry of Housing, Communities & Local Government was last updated in December 2023 [4]. This replaces the previous version published in September 2023. The NPPF is currently under consultation and changes to the framework will be reflected within the ES submission.

4.1.2 The NPPF sets out the Government's planning policies for England and how they should be applied. Local and neighbourhood plans are prepared using the policies within this framework, therefore making the NPPF a material consideration in planning application decisions.

4.1.3 The following chapters of the NPPF are particularly relevant to the Proposed Development:

- Chapter 2 – Achieving sustainable development
- Chapter 6 – Building a strong, competitive economy
- Chapter 11 – Making effective use of the land
- Chapter 14 – Meeting the challenge of climate change, flooding and coastal change
- Chapter 15 – Conserving and enhancing the natural environment

4.1.4 Chapter 2 explains the purpose of the planning system to promote suitable development, with three overarching objectives, covering economic, social and environmental policies.

4.1.5 Paragraph 11 is key to encouraging suitable development as "plans and decisions should apply a presumption in favour of sustainable development….For decision-taking this means: c) approving development proposals that accord with an up-to-date development plan without delay".

4.1.6 Paragraph 38 reiterates the emphasis on approving suitable development, stating that "Local planning authorities should approach decisions on Proposed Development in a positive and creative way.…Decision-makers at every level should seek to approve applications for sustainable development where possible."

4.1.7 Chapter 6 sets out how planning policies should support economic growth at a local level and wider, and support areas in which the UK can become a global leader. Reference to the need for allowing the development of clusters of high technology industries at a suitable scale for the area, is also included.

4.1.8 Chapter 11 promotes the effective use of land balanced against safeguarding environmental and living conditions requiring strategic policies making as much use as possible of previously developed land.

4.1.9 Chapter 14 sets out how policies should ease the transition to a low carbon future, ensuring that plans consider the impacts climate change will continue to have. Policies should also support methods of significantly reducing greenhouse gas emissions and support low carbon energy and the infrastructure it requires.

4.1.10 Chapter 15 sets out how policies should protect and enhance the environment, through minimising the impact to the character and biodiversity of an area, preventing new developments that may result in significant levels of pollution, and where possible developments should be designed to improve the local environment.

4.2 National Policy Statements

4.2.1 Specific National Planning Statements (NPSs) have been issued by the Government to provide policy context for developments that are deemed Nationally Significant Infrastructure Projects (NSIPs). The thresholds for a development to be deemed a NSIP are set out in Part 3 of the Planning Act 2008. While NPSs apply to NSIPs rather than planning applications under the Town and Country Planning Act 1990 (TCPA), they can have points of relevance in the determination of other planning consent applications.

4.2.2 As of January 2024, NPS for Energy (EN-1) [5] has been revised to reflect the outlined strategy of the Energy White Paper, published in December 2020, to transform the energy system. Therefore, to meet the goal of Net Zero, there is a recognition with the NPS which states that

4.2.3 *"Meeting these objectives necessitates a significant amount of new energy infrastructure, both large nationally significant developments and small-scale developments determined at a local level. This includes the infrastructure needed to convert primary sources of energy (e.g. wind) into energy carriers (e.g. electricity or hydrogen)".*

4.2.4 The policy goes on the create the need case for increasing the supply of clean energy from hydrogen manufactured using low carbon processes (low carbon hydrogen) defined into blue and green hydrogen sources.

4.2.5 The NPS clearly states the need for low carbon hydrogen referencing the UK hydrogen strategy, ambition of generating up to 10GW of low carbon hydrogen production capacity by 2030. To achieve the ambition, substantial weight is afforded by the NPS paragraphs 3.4.12 to 3.4.22 for hydrogen infrastructure.

4.3 Marine Policy Statement and the East Inshore and East Offshore Plans

4.3.1 The Marine Policy Statement (MPS) is "the framework for preparing Marine Plans and taking decisions affecting the marine environment. It will contribute to the achievement of sustainable development in the United Kingdom marine area" [6].

4.3.2 Along with the MPS, Marine Plans produced by the Department for Environment, Food and Rural Affairs (DEFRA) in 2014 also support the planning system for England's seas. The East Inshore and East Offshore Marine Plan [7] covers the marine area that the water outfall location for the Proposed Development is located within.

4.3.3 Section 2 provides the visions and objectives for the East Marine Plan areas, with the vision being that "By 2034, sustainable, effective and efficient use of the East Inshore and East Offshore Marine Plan Areas has been achieved, leading to economic development while protecting and enhancing the marine and coastal environment, offering local communities new jobs, improved health and well-being. As a result of an integrated approach that respects other sectors and interests, the East marine plan areas are providing a significant contribution, particularly through

offshore wind energy projects, to the energy generated in the United Kingdom and to targets on climate change."

4.3.4 The key policies of relevance to the Proposed Development are those related to cumulative impacts affecting the marine plan area and adjacent terrestrial area (EC01), protection and enhancement of biodiversity (BIO1 / BIO2), climate adaptation mitigation (CC1).

4.4 Additional National Policy Considerations

4.4.1 Numerous policy papers have been produced in recent years which reflect the increasing emphasis the Government has placed on decarbonising the UK. The objectives set out in these policy papers include the use of hydrogen and Carbon Capture and Storage (CCS) technology to decarbonise the power and industrial sectors. Additional national policy papers that are of particular relevance to hydrogen projects such as this Proposed Development include:

- The Clean Growth Strategy [8]
- The UK carbon capture, usage and storage (CCUS) deployment pathway: an action plan [9]
- The Ten Point Plan for a Green Industrial Revolution [10]
- National Infrastructure Strategy [11]
- Energy White Paper: Powering our net zero future [12]
- Industrial Decarbonisation Strategy [13]
- UK Hydrogen Strategy [14]
- Net Zero Strategy: Build Back Greener [15]
- Hydrogen Net Zero Investment Roadmap [16]

4.5 Local Policy

4.5.1 The Development Plan for North Lincolnshire comprises the North Lincolnshire Local Development Framework (LDF) [17] and the 'Saved Policies' of the North Lincolnshire Local Plan [18].

4.5.2 The LDF comprises a suite of Development Plan Documents (DPDs) that set out the local planning policy for the area for the period to 2026. The DPD documents that are considered to be of relevance to the Proposed Development are:

- the Core Strategy (adopted June 2011) [19]
- the Housing and Employment Land Allocations DPD and Proposals Map (adopted March 2016) [20]

4.5.3 The North Lincolnshire Local Plan was adopted in May 2003 [21]. This plan has been largely replaced by the LDF, but a number of its policies have been saved and are still therefore potentially material to the determination of planning applications.

4.5.4 NLC is currently in the process of preparing a new Local Plan. The plan is currently at Stage 6 submission and examination with adoption, Stage 7, scheduled for 2025. At present the new draft

Local Plan is of limited weight with respect to the planning process. However, the consultation process will continue to be reviewed so that the Proposed Development may align with the emerging plan as it is formally adopted.

4.5.5 The Site is shown in Inset 57 'South Humber Bank' of the LDF Proposals Map [22]. The Site is subject to the following allocations and surrounding designations:

- Proposed Employment Land (SHBE-1)
- South Humber Bank Landscape Initiative (LC20)
- Defined Industrial Buffer (IN6)
- Landscape Enhancement Scheme (LC15)

4.5.6 The Core Strategy (Policy CS12) and Housing and Employment Land Allocations DPD (Policy SHBE-1) identify the South Humber Bank as a 'Strategic Employment Area'.

4.5.7 Within this area around 900 hectares is identified for new employment and industrial development and there is recognition of the essential nature of the area to maximise employment opportunities equivalent to the sites strategic offer by creating major employment, high job density and inward investment which align with emerging technologies such as hydrogen production and CCS. These policies also state that it will be important to protect and enhance the biodiversity and landscape character of the South Humber Bank.

4.5.8 Saved Local Plan Policy IN6 'Defined Industrial Buffer Areas' states that development will not be permitted within the defined amenity buffer areas associated with the South Humber Bank in order to maintain the separation between industry and residential areas. Within the buffer areas, schemes for indigenous tree and shrub planting and habitat creation will be required. Additionally, Saved Local Plan Policy IN3, 'Industrial and Commercial Development in the Urban Area, Principal Growth Settlements, South Humber Bank Area' will permit industrial development B1, B2 and B8 and extensions to buildings which have layouts, materials and site settings considered to be sympathetic to the surrounding landscape.

4.5.9 The Local Development Framework policy details safeguards, enhancement, and promotion of North Lincolnshire's internationally, nationally and locally recognised areas for nature conservation importance and biodiversity. Saved Local Plan Policy LC20 relates to 'The South Humber Bank – Landscape Initiative' and confirms that the aim of this is to achieve environmental enhancement across the South Humber Bank, improve the appearance of the industrial zones and retain buffer areas between those and the residential areas. The initiative extends across much of the South Humber Bank. Accompanying the landscape initiative is LC15 which is shown on the proposals map (Insert 57) in an indicative manner. The Policy details the importance of screening potentially visually intrusive developments.

4.5.10 The policies within the Core Strategy and Housing and Employment Land Allocations DPD [20] that it is considered may be relevant to the determination of the planning application for the Proposed Development include:

- Policy CS1: Spatial Strategy for North Lincolnshire;
- Policy CS2: Delivering more Sustainable Development;
- Policy CS3: Development Limits;
- Policy CS11: Provision and Distribution of Employment Land

- Policy CS12: South Humber Bank Strategic Employment Site – A Broad Location;
- Policy CS17: Biodiversity;
- Policy CS18: Sustainable Resource Use and Climate Change;
- Policy CS19: Flood Risk;
- Policy CS20: Sustainable Waste Management;
- Policy CS25: Promoting Sustainable Transport;
- Policy SHBE-1: South Humber Bank Strategic Employment Site; and
- Policy PS1: Presumption in Favour of Sustainable Development.

4.5.11 The 'Saved' policies of the 2003 Local Plan [18; 21] that may be considered relevant to the determination of the planning application for the Proposed Development include:

- Policy IN3: Industrial and Commercial Development in the Urban Area, Principal Growth Settlements, South Humber Bank Area (including North Killingholme Airfield) and Humberside International Airport;
- Policy IN6: Defined Industrial Buffers;
- Policy RD2: Development in the Open Countryside;
- Policy DS1: General Requirements (Development Standards);
- Policy DS3: Designing out Crime;
- Policy DS7: Contaminated Land;
- Policy DS9: Development of Land in the Vicinity of Established Hazardous Installations and Pipelines;
- Policy DS10: New Hazardous Installations and Pipelines;
- Policy DS11: Polluting Activities;
- Policy DS12: Light Pollution;
- Policy DS13: Groundwater Protection and Land Drainage;
- Policy DS14: Foul Sewage and Surface Water Drainage;
- Policy DS15: Water Resources;
- Policy DS16: Flood Risk;
- Policy T1: Location of Development;
- Policy T2: Access to Development;
- Policy T18: Traffic Management;
- Policy T19: Car Parking Provisions and Standards;
- Policy LC1: Special Protection Areas, Special Areas of Conservation and Ramsar Sites;
- Policy LC2: Sites of Special Scientific Interest and National Nature Reserves;
- Policy LC3: Local Nature Reserves;
- Policy LC4: Development Affecting Sites of Local Nature Conservation Importance;

- Policy LC5: Species Protection;
- Policy LC6: Habitat Creation;
- Policy LC7: Landscape Protection;
- Policy LC20: South Humber Bank – Landscape Initiative;
- Policy HE8: Ancient Monuments;
- Policy HE9: Archaeological Excavation;
- Policy R5: Recreational Paths Network;
- Policy W6: Transportation of Waste;
- Policy W10: Source Separation; and
- Policy W11: Processing Waste Materials.

4.5.12 Supplementary planning guidance SPG2 Industrial Development design guidelines [23] provides objectives to efficiently utilisation of land, site layout, parking, landscaping and the built design.

5 CONSENTING APPROACH

5.1 Town and Country Planning Act 1990

5.1.1 The Proposed Development is not classified as a NSIP under the current NPS and therefore an application for planning consent can, and will, be made under the Town and Country Planning Act (TCPA) 1990.

5.2 Environment Act 2021

5.2.1 With few exemptions, under Schedule 14 Part 1(2) of the Environment Act 2021, planning applications made under the TCPA 1990 must include a condition that a net gain in biodiversity of at least 10% is achieved in order to be granted planning permission.

5.2.2 The Proposed Development will be required to achieve an increase in biodiversity net gain (BNG) of at least 10% in order to be granted planning permission. A BNG assessment will be undertaken for the Proposed Development using the Statutory Biodiversity Metric published by the DEFRA and Natural England [24]. A separate BNG Plan will be submitted alongside the ES with the planning application. Possible biodiversity activities and the BNG plan may be referred to within this Scoping Report and future ES but biodiversity net gain will not be directly covered within the EIA process.

6 AIR QUALITY & HUMAN HEALTH

6.1 Introduction

6.1.1 The Air Quality Chapter will provide an assessment of the potential impacts of emissions to air associated with construction and operation of the Proposed Development on air quality, human health and relevant ecological receptors and provide details of any recommended mitigation measures.

6.1.2 Potential air quality impacts on human health will be assessed against:

- UK Air Quality Standards (AQSs) set out in the Air Quality Standards Regulations 2010 [25]
- Environmental Assessment Levels (EALs) set out in Environment Agency Guidance [26]

6.1.3 Impacts on sensitive ecological sites will be assessed using:

- Critical levels set out in the Air Quality Standards Regulations 2010 and Environment Agency Guidance
- Critical loads and critical levels taken from the Air Pollution Information System (APIS) [27]

6.1.4 In addition to the impacts associated with the Proposed Development, the assessment will include consideration of existing background air quality in the locality and the potential contributions from other projects which are not yet in operation but have planning permission and could influence future local air quality.

6.1.5 Potential sources of emissions which could impacts air quality are anticipated to be:

- Emission of dust relating to earthworks, construction and track-out onto local roads
- Mobile construction plant onsite exhaust emissions
- Emissions associated with construction traffic
- Auxiliary combustion plant emissions
- Operational traffic emissions

6.2 Legislation and Policy

Air Quality Standards Regulations 2010

6.2.1 The Air Quality Standards Regulations 2010 [25] define legally binding ambient air quality standards for a range of pollutants and the locations at which the limit values apply. The Regulations implement the requirements of the EU Ambient Air Quality Directive (2008/50/EC) which have been carried over into UK law following the UK withdrawal from the European Union (EU).

6.2.2 The limit values relate to concentrations in ambient air, defining ambient air as “outdoor air in the troposphere, excluding workplaces where members of the public do not have regular access.”

6.2.3 The Regulations make it clear that air quality standards relating to human health do not require assessment at the following locations:

- any location situated within areas where members of the public do not have access and there is no fixed habitation;
- on factory premises or at industrial locations to which all relevant provisions concerning health and safety at work apply; and
- on the carriageway of roads and on the central reservations of roads except where there is normally pedestrian access to the central reservation.

6.2.4 The Air Quality Regulations also set critical levels for the protection of vegetation. These do not apply:

- More than 20 km from an agglomeration (population >250,000)
- More than 5 km from a Part A industrial process
- More than 5 km from motorways
- More than 5 km from built up areas (population >5,000)

6.2.5 Critical levels will, however, be assessed at all relevant local ecological sites.

The Air Quality Strategy

6.2.6 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland sets out air quality objectives for ten of the main air pollutants to protect human health, vegetation and ecosystems. The strategy is designed to be an evolving process that is monitored and reviewed. The strategy was first published in 1997, with subsequent revisions in 2000, 2003 and the most recent in 2007 [28]. Current values of the objectives applicable in the area surrounding Killingholme will be adopted in the air quality assessment.

Guidance on Best Available Techniques and Emissions to Air

6.2.7 The Industrial Emissions Directive (IED) (Directive 2010/75/EU) regulates the environmental impacts of a range of facilities and remains in effect following the UK leaving the EU. The IED requirements are implemented via the Environmental Permitting (England and Wales) Regulations 2016 as amended [29].

6.2.8 The activities covered by the IED are set out in Annex I of the Directive. The category of relevance to the Proposed Development is ‘4.2(a) Production of inorganic chemicals such as gases, such as ammonia, chlorine or hydrogen chloride, fluorine or hydrogen fluoride, carbon oxides, sulphur compounds, nitrogen oxides, hydrogen, sulphur dioxide, carbonyl chloride’.

6.2.9 The Proposed Development will require an Environmental Permit issued by the Environment Agency under the terms of the Environmental Permitting (England and Wales) Regulations 2016 as a ‘Part A (1) 4.2 (a)(i) inorganic chemicals’ activity’. This will include a requirement to demonstrate the application of Best Available Techniques (BAT) as required under the IED, including consideration of emissions to air.

6.2.10 The Environment Agency published guidance for 'Hydrogen production by electrolysis of water: emerging techniques - Emerging techniques on how to prevent or minimise the environmental impacts of hydrogen production by electrolysis of water' in March 2024 [2]. This sets out the environmental criteria, against which environmental permit applications for electrolysers will be assessed, and as such presents the appropriate BAT reference. Additionally there may be relevant aspects within the BAT Reference document (BREF) for Large Volume Inorganic Chemicals, Ammonia, Acids and Fertilisers [30]

6.2.11 Other emission legislation, such as the Medium Combustion Plant Directive (MCPD, Directive 2015/2193), also implemented through the Environmental Permitting Regulations [29], may also be relevant if auxiliary combustion plant with a thermal input rating in the range 1 to < 50 MWth are required, for instance to support emergency shutdown in the event of a loss of electrical power.

Relevant Planning Guidance

6.2.12 In terms of construction, the primary air quality impact of concern will be dust. The Institute of Air Quality Management (IAQM) has recently updated its published guidance on the assessment of dust from demolition and construction [31].

6.2.13 In terms of operation, guidance from Environmental Protection UK (EPUK) and the IAQM has been produced to ensure that air quality is adequately considered in the land-use planning and development control process [32]. Guidance has also been published by the IAQM relating to the assessment of air quality impacts on designated conservation sites for planning purposes [33]. The guidance provides professionals working within the planning system a means of reaching sound decisions, giving consideration to the air quality implications of proposed developments.

6.2.14 Where air quality impacts do not fall within the scope of the above planning guidance, or where supplementary information or interpretation is required, the Environment Agency guidance on 'Air emissions risk assessment for your environmental permit' [26] will be applied.

6.3 Baseline Conditions

6.3.1 Background air concentrations will be required to assess the total predicted environmental concentration (comprising the sum of the modelled impact from the Proposed Development and the background concentration) against the relevant air quality standards and environmental assessment levels. Background air concentrations will be derived based on the following sources:

- DEFRA modelled background concentration maps at 1 km resolution, published to assist local authorities in their review and assessment of local air quality (Local Air Quality Management (LAQM) data). The most recent years for which data are available are 2018 for Nitrogen Oxides (NO_x) and nitrogen dioxide (NO_2) and 2001 for carbon monoxide (CO).
- The nearest DEFRA automatic monitoring site measuring NO_2 and NO_x concentrations at Immingham Woodlands Avenue, situated approximately 5 km from the Site. Hourly data are available from 2017 onwards.
- The nearest DEFRA automatic monitoring site measuring CO concentrations at Hull Freetown, situated approximately 10 km from the Site. Data are only available until 2012.

- Two local authority run continuous monitoring sites measuring NO_2 and NO_x within a few kilometres of the Proposed Development, namely Killingholme Primary School (NLC) and Kings Road Immingham (North East Lincolnshire Council (NELC)).
- A range of local diffusion tube monitoring sites run by NLC and NELC, with data reported in the respective Local Authority Annual Air Quality Status Reports.
- Location specific Ammonia (NH_3) and NO_x concentrations extractable from APIS. The latest data is 2020-2022 three year average.

6.3.2 A review will be carried out for each of the pollutants emitted in relation to the Proposed Development. For any species where suitable local monitored or mapped data is not available, concentrations will be derived from a wider review of measured or mapped concentrations for areas with similar characteristics to the area local to the Proposed Development, incorporating conservative assumptions to ensure the assessment represents a reasonable worst case.

6.3.3 For background air concentrations and background acid and nitrogen deposition at ecological sites, the information will be extracted from APIS. The data can be extracted on a site and habitat specific basis for special areas of conservation (SACs), special protection areas (SPAs) and sites of special scientific interest (SSSIs) and on a location and habitat specific basis (easting, northing) for Local Wildlife Sites (LWS).

6.4 Receptors

Residential receptors

6.4.1 Experience from modelling the impacts of industrial sources suggests maximum air quality impacts typically occur within 2 km of the release point. In relation to the Main Site, impacts will be considered at the following locations, representing the closest residential areas to the Main Site and indicative pipeline routes as shown in Map 6-1 and Table 6-1. Impacts will also be considered at the grid maximum location as determined by the modelling, giving consideration to the relevance of that location to human exposure.

Table 6-1 Residential Receptor locations for the Air Quality Assessment

Receptor	Location	Grid Reference	Approximate Distance to Main Site (km)	Approximate Distance to Closest Pipeline [western routes] (km)
R1	Swinster Lane	514320 E, 419320 N	1.2	1.0
R2	Scrub Lane (Roselea)	514270 E, 419050 N	1.2	0.7
R3	Brick Lane (Fairfields)	514640 E, 418830 N	0.8	0.35
R4	Chase Hill Road	514430 E, 418210 N	1.3	0.21
R5	Manor Farm	514464 E, 417670 N	1.6	0.42

Receptor	Location	Grid Reference	Approximate Distance to Main Site (km)	Approximate Distance to Closest Pipeline [western routes] (km)
R6	Church Lane, North Killingholme	514591 E, 417362 N	1.7	0.23
R7	St Denys Close, South Killingholme	514970 E, 416454 N	2.5	0.5

6.4.2 There are no residential receptors in closer proximity to the indicative eastern pipeline route than the indicative western pipeline routes with distances from the eastern pipeline route typically being at least 1 km greater than those shown in Table 6-1.

6.4.3 There are several workplace receptors in close proximity to the proposed eastern pipeline route where construction impacts will need to be considered including Benton Bros (Transport Ltd), Able Humber Ports Ltd and Immingham West Fire Station. There are also a small number of workplace receptors. The main workplace receptors in relation to the western routes are associated with the Lindsey Oil refinery.

Air Quality Management Areas

6.4.4 The closest Air Quality Management Area (AQMA) is the Hull AQMA No.1. declared by Kingston-upon-Hull City Council for annual mean NO_2. This is located over 10 km from the Proposed Development and as such is well outside the area where air quality would be impacted by emissions from the Proposed Development. No AQMAs will therefore be considered in the air quality assessment.

Ecological Receptors

6.4.5 Environment Agency Guidance on the assessment of potential impacts of air quality and deposition on protected conservation areas is set out on the gov.uk website [26]. This requires the assessment of impacts on:

- any SACs, and Ramsar sites (protected wetlands) within 10 km of a Proposed Development
- any SSSIs or local nature sites (ancient woods, LWS, national and local nature reserves) within 2 km of a Proposed Development

6.4.6 Based on these distance criteria, as seen in Maps 6-2 and 6-3, the following sites were identified for inclusion in the assessment.

- Humber Estuary SAC (~ 1.4 km NE of the Main Site)
- Humber Estuary SPA and Ramsar (~ 0.9 km NE of the Main Site)
- Humber Estuary SSSI (~ 1.4 km NE of the Main Site)
- North Killingholme Haven Pits SSSI (~ 0.9 km NE of the Main Site)

- Burkinshaw's Covert LWS (~ 0.1 km south of the Main Site and immediately adjacent to the eastern pipeline route)
- Halton Marsh Clay Pits LWS (~ 1.1 km NE of the Main Site)
- Scrub Lane East Field LWS (~ 1.2 km NW of the Main Site)
- Swinster Lane Field LWS (~ 1.3 km NW of the Main Site)
- East View Meadow LWS (~ 1.9 km NW of the Main Site)
- Mayflower Wood Meadow (~ 1.2 km south of the western pipeline routes)
- Chase Hill Wood LWS (adjacent to the east side of the Main Site)
- Station Road Field LWS (adjacent to the eastern pipeline route)
- Rosper Road Pools LWS (adjacent to the eastern pipeline route)
- Eastfield Road Railway Embankment LWS (adjacent to the western pipeline routes)

6.4.7 No ancient woodlands, national nature reserves or local nature reserves were identified within 2 km.

6.5 Potential Effects

Construction

6.5.1 Potentially significant air quality impacts arising from the construction phase to be considered in the EIA will be:

- Emission of dust relating to earthworks, construction and track-out onto local roads
- Mobile construction plant onsite exhaust emissions
- Emissions associated with construction traffic

6.5.2 Dust suppression and control measures will be included within the CEMP to minimise both on and off-site dust emissions. IAQM guidance for the assessment of dust emissions from construction [31] recommends that residual impacts from construction dust can be screened out for human health and amenity receptors at a distance of greater than 250 m from the development site. Based on the receptor distances in Table 6-1, and Paragraph 6.4.2, it is proposed that dust emission assessment is screened out for residential receptors in relation to the Main Site and eastern pipeline route. Further assessment will be limited to residential receptors located within 250 metres of the western pipeline routes. Consideration will also be given to workplaces immediately adjacent to the eastern and western pipeline routes.

6.5.3 IAQM guidance for the assessment of dust emissions from construction [31] suggests that residual impacts from construction dust can be screened out for ecological receptors greater than 50 m from the development site and 250 m from the site entrance. Based on Paragraph 6.4.6, it is proposed that dust emission assessment is screened out for ecological receptors other than those listed as adjacent to the Main Site and eastern and western pipeline routes.

6.5.4 In relation to mobile construction plant onsite exhaust emissions, the recently updated IAQM guidance on construction dust [31] states that experience of assessing the exhaust emissions

from on-site plant non-road mobile machinery (NRMM) and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. For site plant and on-site traffic, consideration should be given to the number of plant/vehicles and their operating hours and locations to assess whether a significant effect is likely to occur.

6.5.5 Emissions from NRMM associated with the Proposed Development will be temporary and localised, particularly in relation to the pipeline construction, and will be controlled via the application of appropriate emissions standards and through best-practice mitigation measures, as listed within the CEMP for the Proposed Development. Given that air quality impacts will be limited and will drop off rapidly with distance from source it is proposed that onsite exhaust emissions are scoped out of the assessment.

6.5.6 The IAQM air quality planning guidance [32] includes indicative criteria for assessing whether an air quality assessment is required in relation to traffic. Assessment is recommended where there is:

An increase in Light Duty Vehicles flows of:

- More than 100 annual average daily traffic (AADT) within or adjacent to an AQMA
- More than 500 AADT elsewhere

An increase in Heavy Duty Vehicles flows of:

- More than 25 annual average daily traffic (AADT) within or adjacent to an AQMA
- More than 100 AADT elsewhere

6.5.7 The anticipated peak construction traffic AADT values will be screened against the IAQM criteria to determine whether further assessment is required. Where a need for more detailed assessment is identified, the ADMS Roads dispersion model will be used to estimate changes in concentrations of NO_2 and particulate matter (PM_{10} and $PM_{2.5}$) at local sensitive receptors (residential and ecological) relating to changes in traffic flows for assessment against the applicable air quality standards and environmental assessment levels.

Operation

6.5.8 Potentially significant air quality impacts arising from the operational phase will be:

- Operational traffic emissions
- Auxiliary plant stack emissions

6.5.9 In relation to operational traffic, the Proposed Development is not within or adjacent to an AQMA and anticipated staff and delivery vehicle movements will be well below the IAQM screening values set out in Paragraph 6.5.6. As such it is proposed that air quality assessment for operational traffic emissions are scoped out from inclusion in the EIA.

6.5.10 There are no anticipated routine emissions to atmosphere associated with the Proposed Development other than the venting of oxygen as a by-product of the electrolysis process and occasional purging / venting of hydrogen during start-up, shut-down and maintenance activities. Neither of these species are considered air quality pollutants.

6.5.11 During abnormal circumstances, such as an emergency shutdown due to a loss of power, an emergency diesel or liquid biofuel generator may be required to support the safe shutdown of the plant. Such emergency events would be rare and limited in duration. As such, consideration of auxiliary plant air quality impacts will be limited to the anticipated routine testing regime.

6.6 Air Quality Impacts to be Scoped In and Out of the EIA

6.6.1 The impacts to be scoped in and out of the EIA are summarised in Table 6-2.

Table 6-2 Potential Impacts to be Considered within the Air Quality Assessment

Project Phase	Effect	Human Receptors Scoped In/Out	Ecological Receptors Scoped In/Out
Construction	Construction dust emissions from Main Site	Out	In for Chase Hill Woods LWS Out for other receptors
	Construction dust emissions from Western Pipeline Routes	In	In for Eastfield Road Railway Embankment LWS Out for other receptors
	Construction dust emissions from Eastern Pipeline Route	In for workplace receptors Out for residential receptors	In for Burkinshaw's Covert LWS, Station Road Field LWS and Rosper Road Pools LWS Out for other receptors
	Construction Plant Exhaust Emissions	Out	Out
	Construction Plant Traffic	In	In
Operation	Auxiliary plant emissions	In	In
	Operational vehicle emissions	Out - There will be no significant increase in operational traffic numbers and as such these will screen out against the IAQM assessment guidance.	

6.7 Mitigation

Construction

6.7.1 The potential impacts of construction on air quality will be controlled through the use of a CEMP to ensure good practice is followed and that impacts are minimised in relation to construction traffic, onsite emissions and dust generation. Where required, construction equipment will conform with the applicable emission standards (such as those set in the Non-Road Mobile Machinery Regulation (Regulation (EU) 2016/1628)) and the CEMP will include measures to minimise emissions (such as no engine-idling).

Operation

6.7.2 As discussed in section 6.2, the Proposed Development and any auxiliary plant will be designed to comply with the relevant emissions requirements and the application of Best Available Techniques required by UK legislation. A stack height assessment will be carried out to determine the appropriate stack height taking into consideration the rates at which ground level air quality impacts reduce with increasing emission height and the impact of potential conflicting effects such as visual impact.

6.8 Proposed Assessment Methodologies

Construction

6.8.1 The impact of dust during the construction phase will be assessed using the guidance set out in the IAQM document 'Guidance on the Assessment of Dust from Demolition and Construction' [31]. This guidance will be used to qualitatively determine any dust risks associated with construction, determine whether residual significant effects are likely and recommend appropriate mitigation measures.

6.8.2 The potential impacts of construction traffic emissions will be assessed based on a two stage screening approach, followed by detailed modelling if required:

1. Screening based on IAQM air quality planning guidance [31] and Defra Local Air Quality Management Technical Guidance [34]
2. Screening based on the Design Manual for Roads and Bridges (DMRB) methodology [35]
3. Dispersion modelling using the ADMS-Roads model

6.8.3 It is expected that construction equipment and construction traffic emissions will screen out without the need for dispersion modelling.

Operation

Scope and Methodology

6.8.4 The assessment of any auxiliary plant air quality emissions will be undertaken in line with the IAQM guidance for assessing air quality impacts [32] [33] including screening of emissions against the 5 mg/s NO_x emission rate.

6.8.5 Further screening will be undertaken through the use of EA screening tools, which, whilst developed to support Environmental Permit applications, may also be considered as suitable for determining air quality concentrations for assessment against IAQM significance criteria. These will include:

- Predicting air quality impacts using the approach set out in the guidance 'Air emissions risk assessment for your environmental permit' [26]
- Application of the Simple Calculation of Atmospheric Impact Limits (SCAIL) Combustion tool (https://www.scail.ceh.ac.uk/cgi-bin/combustion/input.pl)

6.8.6 Should dispersion modelling be required, it will be undertaken using the Atmospheric Dispersion Modelling System (ADMS) version 5.2, as developed by Cambridge Environmental Research Consultants (CERC) and in line with EA advice for dispersion modelling and assessing against IAQM significance criteria [36].

6.9 Assessment Limitations and Assumptions

6.9.1 The screening approaches outlined have been specifically developed to represent a conservative approach to the assessment of air quality impacts.

6.9.2 The ADMS dispersion model and ADMS ROADS model have been extensively validated against available measured data obtained from real world situations, field campaigns and wind tunnel experiments; a range of validation papers can be found on the CERC website model validation page (https://cerc.co.uk/environmental-software/model-validation.html).

6.9.3 The most significant source of uncertainty in any dispersion modelling process is associated with the dispersion modelling process itself. This uncertainty will be addressed through the use of a series of worst-case assumptions to ensure that estimates of impacts on air quality are likely to be over-estimates rather than under-estimates. This conservative approach will remove the need for detailed sensitivity analysis across the multiple model inputs. Examples of worst-case assumptions may include:

- Assuming full load running for all hours of the year
- Assuming emissions are always at the Emission Limit Value
- Basing impacts on the worst-case over five years
- Assessing human health impacts at the maximum impact point on the grid
- Basing impacts on ecological sites at the worst-case impact point over the site

6.10 Cumulative Effects

6.10.1 In addition to the potential air quality impacts associated with the Proposed Development, the assessment will include consideration of existing background air quality in the locality. Where process contributions do not screen out as negligible or insignificant, the potential contributions from other projects which are not yet in operation but have planning permission and could influence future local air quality, will additionally be considered.

7 WATER QUALITY

7.1 Introduction

7.1.1 The potential impact of the Proposed Development on surface water quality and aquatic ecology in both the construction and operational phase will be considered. The detail of the assessments will depend on choices for key plant design options which will be made during the course of project development and on the outcome of consultations with key stakeholders. The aqueous discharges from the plant during the operational phase will be assessed quantitatively, along with the pathways to potential sensitive receptors.

7.1.2 A water supply will be required continuously for the Proposed Development for the production of Ultra-Pure Water (UPW) to use as feedstock for the electrolyser. A small portion of the effluent from the Phillips 66 Refinery, that would have otherwise been discharged to the South Killingholme Drain, is expected to be transported to the Proposed Development via a pipeline; this will supply the full quantity of raw water required and will be subject to further assessment during the detailed design stage. It is possible an industrial water supply will be used as a back-up supply if the Phillips 66 effluent is unavailable or temporarily unsuitable. The volume flow rate of effluent from the water treatment plant producing UPW will depend on the quality of the raw water source; it will essentially be the raw Phillips 66 effluent concentrated by approximately a factor of two. Effluent from the water treatment plant will be discharged to the Humber Estuary via the existing site purge pit and existing outfall located at (517396E, 419527N) as shown in Map 7-1. The total effluent flow from the Proposed Development to the Humber Estuary will be considerably less than the 60000 m^3/day flow limit that was previously in place for KPS-B when it was operating in combined cycle mode. An approximate estimate for the volume of Phillips 66 effluent required as a raw water input 28 m^3/hour. The effluent flow rate to the Humber is expected to be approximately 12 m^3/hour. Final values will be dependent on the technology selected.

7.1.3 The impact of the aqueous discharge from the Proposed Development via the outfall will be assessed. This will include an assessment of heat discharged to surface water and an assessment of the impact of any chemicals discharged, whilst considering the salinity and density of the discharge. The reuse of the effluent from the Phillips 66 refinery will result in a portion of this effluent being modified and discharged direct to the Humber Estuary via the existing KPS-B outfall, rather than discharge via the South Killingholme Drain.

7.2 Legislation and Policy

7.2.1 EU Directive 2000/60/EC established a framework for Community action in the field of water policy (the Water Framework Directive (WFD)) and requires Environmental Quality Standards (EQS) to be set for the concentrations of polluting substances in surface waters.

7.2.2 Under the requirements of the WFD, which was originally transposed into UK legislation by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003, the EA is required to produce River Basin Management Plans (RBMP). The current RBMP for the Humber was published in 2022 [37]. This was produced under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 [38] and Ministerial Guidance on river basin planning 2021 [39]. The Humber RBMP defines the existing water quality of the River

Humber and identifies the pressures that are affecting the potential to reach the “good status” required by the WFD. The plan includes environmental objectives and the programme of measures required to achieve those objectives.

7.2.3 Information within the RBMP is used by the Environment Agency and other public bodies to make planning decisions and decide on the conditions to include in environmental permits.

7.2.4 The EA will control and regulate the Proposed Development with respect to the discharge of any effluents via an environmental permit that will be required before the Proposed Development can operate. The environmental permit will include specific limits for a range of pollutants that could be present in any effluent proposed to be discharged to surface waters. These limits will be set to ensure that the process contribution of any pollutant within the scope of the WFD does not detrimentally affect the potential for the receiving water body to achieve good status.

7.2.5 Assessments of potential impacts of substances discharged to surface water from the Proposed Development in the operational phase will be undertaken using the guidance 'Surface water pollution risk assessment for your environmental permit' [40].

7.2.6 The East Inshore and East Offshore Marine Plans [7] is the report which covers the marine area within which the Proposed Development is located (see section 4.3).

7.3 Baseline Conditions

7.3.1 The Humber Estuary is a dynamic estuarine environment with complex hydrodynamic processes controlling local and wider scale sediment transport processes. The nature of the estuarine hydrodynamic processes is determined by a range of factors including the local and general estuary morphology, wave climate, tidal range and freshwater inputs. Additionally, the Humber Estuary contains numerous man-made structures that change the flow and sediment patterns.

7.3.2 The outfall is in the Humber Lower Water Body. The RBMP classes this as a heavily modified water body with a moderate ecological status.

7.3.3 A desktop study will be undertaken to determine aquatic ecology baseline conditions. In addition to this baseline study, publicly available water quality data will be acquired from other sources such as the RBMP catchment explorer. This will be analysed and presented in the ES.

7.3.4 Work undertaken for the proposed Able Marine Energy Park that assessed the impact of the proposed park on the KPS-B intake and outfall will be considered. Whilst the intake is not expected to be used for the Proposed Development, the existing outfall is expected to be used as the aqueous discharge point to the Humber Estuary.

7.4 Receptors

7.4.1 The Humber Estuary is the receiving water for the effluent discharged from the water treatment plant and other aqueous discharges such as surface water drainage that enter the Humber via the site purge pit.

7.4.2 The following designations apply to the areas encompassing the outfall:

- Humber Estuary Special Area of Conservation (Marine Components GB)
  - UK Site Code UK0030170
  - WDPA Code 555536059
- Humber Estuary Special Protection Area (Marine Components GB)
  - UK Site Code UK9006111
  - WDPA Code 555541785
- Humber Estuary Ramsar Site
  - Reference UK11031
- Humber Estuary Site of Special Scientific Interest - 2000240 SSSI

7.4.3 In the immediate vicinity of the outfall lapwing is a priority species for countryside stewardship targeting. Seabirds will forage in the vicinity of the outfall.

7.4.4 There is small area of coastal saltmarsh to the west of the outfall listed in the Priority Habitat Inventory. The outfall is located below the mean low water line. There are mudflats above the mean low water line, in the intertidal zone, also listed in the Priority Habitat Inventory. The MAGIC database (https://magic.defra.gov.uk/) describes the intertidal substrate foreshore as mud. Below the waterline, within 1 km of the outfall, the estuary bed consists of subtidal sand, subtidal mud and subtidal mixed sediment. Both the tidal and intertidal regions in the vicinity of the outfall are classed as soft sediment.

7.4.5 The designations of the Humber Estuary SAC and SSSI also include migratory fish species (Sea Lamprey Petromyzon marinus and River Lamprey Lampetra fluviatilis) and Grey Seal Halichoerus grypus populations.

7.4.6 There are also a number of UK Biodiversity Action Plan priority fish species present. These include Atlantic salmon (Salmo salar), European Eel (Anguilla Anguilla), European Smelt (Osmerus eperlanus), twaite shad (Alosa fallax), sea trout (Salmo trutta), herring (Clupea harengus), cod (Gadus morhua), whiting (Merlangius merlangus), plaice (Pleuronectes platessa) and the Dover (common) sole (Solea solea), as well as both sea and river lamprey.

7.5 Potential Effects

Construction

7.5.1 During the construction phase it is possible spillages or polluted surface water run-off could enter a watercourse, causing contamination. Adhering to a CEMP should minimise the risks associated with the construction phase. The potential impact on water quality through changes to surface water drainage is discussed in Section 8 on Ground Conditions.

Operation

7.5.2 Whilst the discharge from the Proposed Development to the Humber Estuary is comparatively small, it has the potential to change water flows, sedimentation and water quality in the receiving water. These in turn could impact on the aquatic ecology.

7.5.3 A worst case operating scenario will be considered, along with alternative scenarios if deemed appropriate, such as a typical operating case. The output of any assessment and modelling of the aqueous discharge to surface water will be used to assess any potential impacts on both water quality and ecological features.

7.6 Determination of Significance

7.6.1 The significance of the effects that will be considered within the EIA will be determined by the matrix shown in Table 3-1. The levels of impact and magnitude will be defined within the EIA. The effects that will be considered are listed in Table 7-1 below. Whether or not a contaminant in an effluent stream discharged to the Humber can be classed as insignificant is determined by following the guidance for Surface water pollution risk assessment for your environmental permit [40].

Table 7-1 Potential Impacts to be Considered within the Water Quality Assessment.

Water Quality	Effect	Scoped In or Out	Justification
Construction	Changes to surface water flows	Out	Any discharge flow rates during construction will be very small compared with tidal flow in estuary and will be temporary
	Pollution of surface watercourses within or near the Site	In	
	Temporary/permanent loss of intertidal habitat	Out	No interaction with intertidal region expected
Operation	Changes to surface water flows	Out	Discharge flow rate very small compared with flow tidal flow in estuary
	Heat (elevated temperature) discharged to surface water	In	
	Pollutants discharged to surface water	In	

7.7 Mitigation

Construction

7.7.1 A CEMP will be adhered to during the construction phase to minimise impacts on surface water, and to aquatic ecological receptors. For any offshore works, related to refurbishment or installation of new outfall infrastructure, a marine licence will be obtained, alongside a consent from the Harbour Authority.

Operation

7.7.2 A review of the design and performance of the outfall structures will be undertaken to ensure its reuse is appropriate and to identify any necessary modifications. It will be essential to demonstrate that the equipment and operations constitute site specific BAT such that they minimise emissions subject to BAT and that the residual environmental impacts are deemed acceptable.

7.7.3 Aqueous effluent, and contaminants within this water, which could either originate from the Phillips 66 effluent or from chemicals added for use in the operation of the Proposed Development, shall be minimised.

7.7.4 Small volumes of wastewater or sludges with appreciable levels of contamination or specific contaminants that are difficult to treat are likely to be taken offsite by an approved contractor for disposal.

7.8 Proposed Assessment Methodologies

Baseline Assessment

7.8.1 Baseline data will be obtained from publicly available environmental data sources such as the Defra Data Services Platform and work undertaken for the Able Marine Energy Park development. Specifically, ambient concentrations of determinands in the Humber Estuary will be obtained from the DEFRA catchment explorer and the Water Quality Archive.

Guidance

7.8.2 The following guidance will be used:

- Surface water pollution risk assessment for your environmental permit [40]

Consultation

7.8.3 Should the screening tests undertaken as part of the surface water pollution risk assessment [40] identify that detailed modelling will be required, consultation with the EA will be undertaken prior to completing any detailed modelling required.

7.8.4 Additional consultation with the following stakeholders will also be undertaken as deemed necessary:

- Marine Management Organisation
- The local Port Authority - Associated British Ports (ABP)
- Natural England
- Water Resources East
- Developers of the Able Marine Energy Park (DCO: TR030006)

Scope and Methodology

7.8.5 The impact of any pollutants released from the Proposed Development to surface water will be assessed by considering process contributions from the Proposed Development in the context of gathered baseline data and by comparison with the relevant environmental standards. Screening assessments will be carried out using guidance on 'surface water pollution risk assessment for your environmental permit' [40] for specific pollutants and priority hazardous substances released from the Proposed Development. A suitable environmental assessment level will be determined for any substances released that may pose a risk to the environment, but do not have an environmental quality standard listed in the guidance. If a pollutant can be screened out as posing no risk to the environment, no further assessment is necessary for that pollutant. If a pollutant in the effluent cannot be screened as posing no risk to the surface water environment, detailed modelling will be undertaken for the EIA.

7.9 Assessment Limitations and Assumptions

7.9.1 As the Proposed Development is a relatively new type of plant, with limited operating experience, it is possible that further potential impacts may be identified and will need to be assessed.

7.9.2 The Humber Estuary is dynamic and it is possible that baseline conditions may change after the assessment is undertaken.

7.10 Cumulative Effects

7.10.1 The impact of the Proposed Development discharge to the Humber will be considered in the context of the planned Able Marine Energy Park. Work undertaken for Able Marine Energy Park Material Change 2 will be referred to [41].

7.10.2 The impact of the Proposed Development discharge to the Humber will be considered in the context of any relevant discharges from the projects identified in section 3.6.3.

8 GROUND CONDITIONS

8.1 Introduction

8.1.1 This section of the Scoping Report summarises the information gathered to date on the baseline ground conditions of the soil and groundwater at the Main Site. Using this information, the potential for likely significant effects from the Proposed Development during the construction and operational phases is considered. Given the indicative nature of the pipeline routes, initial information on baseline conditions have not yet been gathered. The final pipeline route will be included within the Geo-Environmental Assessment and presented in the ES.

8.1.2 A Desk-Based (Phase 1) Geo-Environmental Assessment will be completed to identify potential contaminative uses and provide preliminary geotechnical assessment of the Proposed Development site. This desk-based assessment will identify the potential for land contamination and potential pathways to sensitive receptors. The results of the desk-based assessment and Conceptual Site Model (CSM) will be used to undertake a qualitative risk assessment.

8.1.3 The Phase 1 desk study will note uncertainties and gaps in the available data, if required, and outline additional mitigative measures to address these, prior to construction of the Proposed Development.

8.2 Legislation and Policy

8.2.1 An assessment of potential impacts on existing ground conditions will be undertaken as part of the EIA, including the potential for the Proposed Development to result in land contamination, as defined in Part 2A of the Environment Protection Act 1990.

8.2.2 The phased approach to risk assessment outlined herein is consistent with the Environment Agency's Land Contamination Risk Management (LCRM) guidance [42] and British Standard BS 10175 [43] and therefore in keeping with the Saved Local Policy DS7 – Contaminated Land [21].

8.3 Baseline Conditions

Site History

8.3.1 The Main Site is located in a largely industrial area, with arable land regionally to the north, north-west, west, and southwest. A now demolished gas-fired power station and the Hornsea 400kV and Hornsea Offshore Windfarm substations are located to the north. A HV Cable corridor runs south-north at the western boundary of Uniper owned land. Immingham Docks and a large newly-build car storage area are located to the east adjacent to the Humber Estuary beyond Chase Hill Wood (a local wildlife site which land is owned by Uniper). To the south of the Site runs Chase Hill Road which is frequently utilised by the surrounding industry for transport. Beyond Chase Hill Road towards the south are located the extensive Prax Lindsey oil refinery and the Philips 66 Humber refinery.

8.3.2 The development history of the landholding in which the Main Site is located starts with undeveloped agricultural land until the development of the KPS-B in the early 1990s, with commissioning in 1992. The surrounding area was developed earlier (1950s onwards) for a variety of industrial uses (sewage works, oil refinery, gas works, other industrial uses).

Geology

8.3.3 The British Geological Survey (BGS) Map Viewer indicates that the Main Site is underlain by Till (Devensian) over bedrock of the Burnham Chalk Formation (Upper Cretaceous).

8.3.4 No Made Ground has been recorded on BGS's geological map extracts. However, it should be noted that considerable land raising, basement excavation and deep foundations have been constructed in association with the power station's development. Considering this in addition to site inspection and previous experience in industrial sites, it has been assumed that in localised areas, it is highly likely that Made Ground is present.

8.3.5 The Main Site is noted as being largely underlain by Till (Devensian). These deposits comprise firm to stiff sandy clay with occasional cobbles and boulders and are present from ground level down to depths of approximately over 20 m. This includes a transition zone of up to 2 m of clayey sand and silt grading into clayey gravel with chalk cobbles. BGS borehole logs in the site area confirm the presence of firm-stiff brown glacial till / clay to approximately 18 m below ground level (bgl), with a sandy, silty gravelly transition layer (18-20 m bgl) before reaching the Chalk at approximately 20 m bgl.

8.3.6 The Burnham Chalk Formation (Upper Cretaceous) is known to underlie the Till across the site at depths of approximately 15 to22 m below ground level to over 180 m below ground level. The top 5 m to 10 m of the Chalk has been identified as being weathered chalk gravel in a silty matrix. Below this the Chalk is thinly bedded with flint nodules.

Hydrogeology and Hydrology

8.3.7 The EA aquifer designations for the Main Site are as follows:

- Glacial Till - Unproductive Strata: These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.
- Burnham Chalk - Principal Aquifer: These are layers of rock or drift deposits that have high intergranular and/or fracture permeability, meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

8.3.8 Whilst the Till is considered non-productive, the presence of the layers or lenses of silty sand, clayey silts and soft clays allows for discontinuous horizons of perched groundwater. The site investigations for construction of the current KPS-B identified a piezometric surface at approximately 4.5 m Above Ordnance Datum (AOD) (3.5 m bgl) interpreted to come from one of these sandy layers.

8.3.9 The western and southern extent of the KPS-B site falls within a groundwater Source Protection Zone (SPZ) 3 - Total Catchment. The closest SPZ 1 are located around 2km west and south highly likely pertaining to public water abstraction wells.

8.3.10 The KPS-B site is located on low-lying land within close proximity to the Humber Estuary. Historically, the local area was mostly open fields with established drains until the emergence of industry during the latter half of the 1900s. Albeit a few drains remained, most are managed by the North East Lindsey Internal Drainage Board. Most drains are interconnected and join the pressure level gauge outfall to the Humber Estuary towards the east. The Humber Estuary is located approximately 1.6 km to the east of the Main Site. Other nearby surface water features include the KPS-B retention basin, ponds located in Chase Hill Wood and forested areas eastwards of Prax refinery, and surrounding industry's water bodies highly likely utilised under their respective permitted activities.

Mining, Quarrying and Landfill Activities

8.3.11 The Coal Authority Interactive Map Viewer indicates that the Main Site is not located within a coal mining reporting or development high risk area, and as such it is deemed that a coal mining risk assessment is not required.

8.3.12 There are three historic landfills and registered waste treatment, or disposal sites identified within 500 m of the KPS-B Site. These are associated with the Prax Lindsey oil refinery which is located to the southeast of the Main Site.

Land Contamination

8.3.13 A single pollution incident is known to have occurred in KPS-B in 2011, where approximately 200 litres of diesel leaked to the ground from a fuel line on a hired compressor in the Contractors Compound. The Environment Agency were informed at the time, and the affected soils were removed. Due to the presence of firm-stiff clays at the KPS-B site, likely from the Till, downward migration of contaminants is not expected to have occurred, particularly given the swift response and limited spread of the spill. The risk to the underlying Chalk aquifer was considered to be very low due to the lack of hydraulic connection with the perched water above and the 15m of clay between the groundwater and the spill. Verification sampling confirmed that the area had been satisfactorily remediated. It is understood that no other significant incidents are recorded on the site Environmental Management System.

8.4 Ecological Receptors

8.4.1 Immediately to the east of the Main Site, is Chase Hill Wood, a Local Wildlife Site, and Burkinshaw's Covert, a forested area with small ponds by the eastern border of Prax Oil refinery.

8.4.2 The wider regional area is noted for its biological sensitivity. North Killingholme Haven Pits SSSI located approximately 900 m northeast of the Site and the Humber Estuary SSSI / SAC / SPA and Ramsar approximately 1.5 km east of the site. The Site is within a Nitrate Vulnerable Zone.

8.5 Potential Effects

8.5.1 There are a number of potential effects that could result from development at the site in relation to contaminated land and ground stability. The following potential impacts may be associated with the Proposed Development:

- Disturbance of potentially contaminated soils and groundwater and creation of new pathways allowing contamination to reach sensitive receptors (including construction workers and controlled waters) during construction;
- Hazardous ground gas generation and accumulation from organic rich strata, presenting a risk of explosion or asphyxiation to future site users;
- Use of plant and equipment during construction which could accidentally leak fuels and oils, introducing contaminants to the ground;
- Storage and use of materials and substances with polluting potential (e.g. concretes, fuel, oils and soils) which could be mobilised to ground or controlled waters by run-off or vertical migration in the soil leachate;
- Exposure of construction workers, site users and / or neighbours to potentially contaminated dust during construction activities; and
- Structures impacted by ground stability issues such as subsidence, due to the presence of compressible strata.

8.6 Determination of Significance

8.6.1 A Desk-Based (Phase 1) Geo-Environmental Assessment will be undertaken and will formulate a CSM which details the potential Source–Pathway–Receptor contaminant linkages which may exist at the development site. This will inform a preliminary risk assessment of the site baseline conditions.

8.6.2 The CSM and associated risk assessment will inform the assessment presented in the ES. The assessment will be informed by a review of desk-based information which includes mapped data, aerial photos, historical mapping, the results of an environmental database search and previous geo-environmental assessments.

8.6.3 The significance of any identified effect during both the construction and operational phase of the development will ultimately be determined with regard to the status, extent or spatial scale, duration, probability/likelihood and magnitude of the impact and the sensitivity of the receptor.

8.6.4 The level of the effect and whether those effects identified are considered to be significant will be established through the evaluation of the above elements, as informed by the baseline conditions, and will ultimately be determined through professional judgement.

8.7 Mitigation

8.7.1 The assessment will also identify any mitigation measures that may be deemed necessary to ensure that the development does not give rise to any significant effects during the operational, construction and decommissioning phases.

8.7.2 Mitigative measures could include intrusive investigation, Generic Quantitative Risk Assessment (GQRA), Detailed Quantitative Risk Assessment (DQRA), remediation strategy, verification plan and verification report. Other measures may include recommendations for personal protective equipment or specific construction techniques.

8.7.3 Following mitigation, the assessment will report residual effects.

9 MATERIALS & WASTE MANAGEMENT

9.1 Introduction

9.1.1 This chapter assesses the effect of the Proposed Development in relation to the use of material resources and the generation and management of waste. Wherein:

- Materials are defined as resources used for the construction and during the lifetime of a Proposed Development.
- Waste is defined under the Waste Framework Directive [44] as "*any substance or object which the holder discards or intends or is required to discard*" and this definition is transposed into law in England and Wales by The Waste (England and Wales) Regulations 2011. This definition does not include waste acceptable for recovery, reuse, and recycling. Hence, only inert, non-hazardous, and hazardous waste are considered.

9.1.2 The Proposed Development will prioritise waste prevention, then re-use, recycling, recovery, and finally landfill disposal as set out in The Waste (Management) Hierarchy as shown in Figure 9-1 [45].

9.1.3 The assessment will be carried out in accordance with the Institute of Environmental Management and Assessment (IEMA) guide to: Materials and Waste in Environment Impact Assessment document [46].

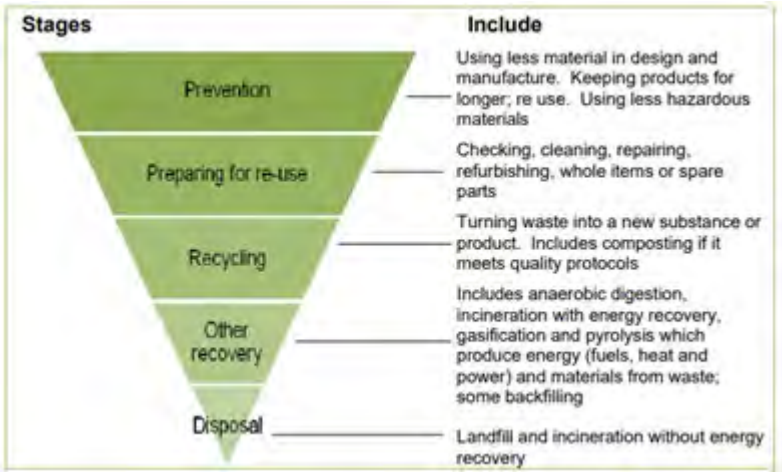


Figure 9-1 The Waste Hierarchy

9.2 Legislation and Policy

9.2.1 A range of relevant legislation, policies and guidance will be used including:

- The Waste (England and Wales) Regulations (2011) [47]
- Hazardous Waste (England and Wales) Regulations 2016 (amendment) [48]
- Waste Management Duty of Care Regulations [49]
- Waste Framework Directive (2008/98/EC) [44]

- The Waste Prevention Programme for England [50]
- Resources and Waste Strategy for England (2018) [51]
- IEMA guide to: Materials and Waste in Environment Impact Assessment (2020) [46]
- The CL:AIRE: Definition of Waste: Development Industry Code of Practice (2011) [52]

9.3 Baseline Conditions

9.3.1 The Proposed Development is anticipated to generate several waste streams requiring consideration, throughout the construction and operational phases.

9.3.2 During construction waste may arise from demolition, excavations, general construction, wastewater from cleaning activities, waste chemicals and fuels and waste metals.

9.3.3 During operation, gaseous waste may arise from continuous venting of oxygen and hydrogen. Also, a diesel generator, only to be used in emergency conditions will have an exhaust. Prior demineralisation processes to improve hydrogen production will produce a continuous reject stream of diluted acids and caustic soda which due to their high pH content could be hazardous. Other liquid wastes anticipated from the hydrogen production plant include spent caustic potash from the electrolysers which will need to be removed and tankered offsite during outages. It is expected that liquid effluents will be discharged to the Humber Estuary via the existing purge pipe under appropriate Permitting regime. Spent catalysts, filters, and ion-exchange resins will also require special treatment and disposal for solid waste.

9.3.4 Table 9-1 below gives the latest EA remaining landfill capacity data available on data.gov.uk. for Yorkshire & Humber [53]. This will be used in the EIA to find suitable landfill facilities, if required.

Table 9-1 Yorkshire & The Humber Landfill Capacity in 2020

Landfill Type	Sub-Regions (cubic metres)				Yorkshire & The Humber (cubic metres)
	Former Humberside	North Yorkshire	South Yorkshire	West Yorkshire	
Hazardous Merchant	476,151	-	-	-	479,151
Non-Hazardous	19,628,181	17,573,742	3,226,393	151,703	40,580,019
Non-Hazardous within SNRHW cell	1,243,333	-	-	0	1,243,333
Inert	15,029,314	864,420	5,650,265	3,384,486	24,928,485
Total	36,376,979	18,438,162	8,876,658	3,536,189	67,227,987

Stabilised Non-Reactive Hazardous Waste (SNRHW)

Source: Environment Agency Remaining landfill capacity: England as at end 2022 [53]

9.3.5 The baseline conditions for waste and materials will specifically look at:

- Space available to manage the waste at relevant scale, regional for inert and non-hazardous, and national for hazardous waste
  - This will include current capacities of inert and non-hazardous waste infrastructure and waste generated in the study and expansive areas
  - Historical and future trends in waste processing, recovery and/or landfill void capacity will be presented and forecast where possible
- Description of type of materials used, waste generated and their volumes
- Availability of main materials used for the Proposed Development and location of mineral safeguarding sites and peat resources
- Site locations used and protected under planning policies for management of waste, minerals extraction and processing areas

9.4 Proposed Assessment Methodology

9.4.1 As defined in the IEMA guide to: Materials and Waste in Environment Impact Assessment [46] two study areas are suggested for assessing the impact of the Proposed Development on materials and waste:

- Development Study Area (first study): This refers to the boundary for the construction of the Proposed Development as well as areas for temporary access, site compounds, working platforms and other enabling activities. This includes an assessment for: mineral safeguarding sites and peat resources, materials required and any supply at higher risk (critical raw materials), waste generated and its direct impact on waste management infrastructure.
- Expansive Study Area (second study): This refers to the closest geographical area for the supply of construction materials for the Proposed Development (national supply), waste management infrastructure and landfill facilities that would be suitable for accepting generated waste (regional for inert/non-hazardous and national for hazardous waste). This expansive study area will be the Yorkshire and the Humber Region. Other waste facilities can be located elsewhere in England. The EIA team will first prioritise assessing waste management facilities available within a 10 - 20 km radius search. Some waste might be sent outside the UK, if this is the best available management method (wider expansive area).

9.5 Sensitive Receptors

9.5.1 The IEMA guide to: Materials and Waste in Environment Impact Assessment [46] defines the sensitive receptor for waste management to be landfill void capacity. Materials are their own sensitive receptors.

Materials

9.5.2 The methodology for assessing effects on material resources will:

- Evaluate baseline of national/regional demand for the main materials by weight required for the Proposed Development

- Study the sensitivity of materials by comparing resources needed for the Proposed Development and their availability.
- Define number of materials to be consumed during construction and operation of the Proposed Development
- Compare national demand against materials to be consumed during construction of the Proposed Development
- Determine sensitivity, magnitude, and subsequently the significance of any effects

9.5.3 The sensitivity of materials relates to the availability and type of resources to be consumed by a development. The sensitivity of materials can be determined by identifying (through trend analysis and other information) any known issues regarding supply and stock; and / or by comparing the sustainable features and benefits of key materials to industry-standard materials.

9.5.4 As stated in the IEMA guidance, magnitude for construction phase will be assessed from the time the site is accessed, through demolition of existing structures, site remediation, works, construction to commissioning. Magnitude of impact for operational phase will be assessed within one full year of the first three years of commissioning. This will be based on a percentage approach which compares materials being consumed by the development and the baseline availability of the market.

Waste

9.5.5 The methodology for assessing effects on waste management will:

- Define current baseline of landfill void capacity in the expansive study area (national & regional)
- Assess historical wastes processing, recovery facilities and landfill baseline capacity and predict future baseline availability for landfill capacity in the expansive study area (national & regional)
- Estimate the amount and type of waste to be produced from construction of the Proposed Development and detail methods of management
- Predict the amount and type of waste to be generated during operations of the Proposed Development and detail methods of management
- Compare the amount of waste estimated to be generated during construction and operations against landfill void capacity
- Determine sensitivity, magnitude, and subsequently the significance of any effects

9.5.6 The sensitivity of waste is related to the availability of regional (and where appropriate national) landfill void capacity in the absence of the Proposed Development. The sensitivity of landfill void capacity is assessed by evaluating the volume of waste anticipated to be disposed within the study area or the wider area and comparing this with the remaining landfill void capacity to identify expected losses over the construction and operational phases. Sensitivity will be split into inert/non-hazardous landfill capacity (regional level) and hazardous landfill capacity (national level).

9.5.7 In terms of assessing magnitude for wastes arising from the Proposed Development, the Landfill Void Capacity (W1) has been selected over the Landfill Diversion (W2) methodology as defined in the IEMA guide to: Materials and Waste in Environment Impact Assessment [46], for the following reasons:

- It is a more robust and detailed methodology
- It is more appropriate for larger and more complex developments, such as the Proposed Development
- It is recommended for statutory EIAs

9.5.8 Under this methodology, the magnitude of impact from waste is assessed by determining the percentage of the remaining landfill void capacity that will be depleted by waste produced during the construction and/or operation phases of the Proposed Development; if landfill capacities are likely to be affected this would be considered as a likely significant effect.

9.6 Potential Effects

9.6.1 Although the detailed design of the Proposed Development is not yet established, it may give rise to several potential effects during the Construction and Operational phases. The anticipated effects and whether they have been scoped in or out of the assessment are included in Table 9-2 below, with rationale for scoping out where applicable.

Table 9-2 Potential effects of the Proposed Development on Materials and Waste

Project Phase	Effects	Scoped In / Out
Construction	Effects on consumption and demand of materials (loss of resources)	In
	Effects on inert and non-hazardous landfill capacity (regional) and hazardous landfill capacity (national)	In
	Effects on mineral safeguarding sites and peat resources in the proximity of the Proposed Development	Out - the Proposed Development is not located in proximity to any mineral safeguarding sites or peat resources.
	Effects on baseline of waste generated	In
Operation	Changes in availability of materials	Out - the consumption of materials during the operational phase will be negligible and will be confined to periodic replacement of equipment.
	Changes in baseline waste arisings	In
	Changes in landfill capacity	In

9.7 Mitigation

9.7.1 Mitigation measures are split into primary, secondary and tertiary levels as defined in the IEMA guidance [46]. Primary mitigation measures are resource-efficient solutions taken during construction and lifetime operation of the Proposed Development. They will be agreed at an early

stage between the EIA and design engineering teams. Tertiary (inexorable) mitigation measures are taken to meet legislations directives, Environmental Permit conditions, best practices and commonly limited environmental effects. Secondary mitigation measures are brought out by the environmental assessment process in case primary and tertiary mechanisms have not been achieved.

9.7.2 Primary/tertiary mitigation measures may include:

- Changing the design for better efficiency of materials usage and limit the risk of adverse impacts (depletion on the environment);
- production of a Waste Options Assessment Study or an Environmental Management Plan (EMP) for better use of materials and waste management;
- promoting the use of sustainable materials (high recycled content) and of circular economy;
- reuse of excavated and other waste material products on site or other development in the proximity;
- assessing opportunities for reuse and recycling materials on site, minimise export and import during construction, operation and end-of-life phases; and
- using of modern methods of construction.

9.7.3 Secondary Mitigation Measures may include:

- Production of a Material Management Plan (MMP) under CL:AIRE Code of practice [52], this promotes reuse of materials;
- production of a Site Waste Management Plan (SWMP) [54], this investigates the type and volumes of waste expected to be produced and proposes a waste management strategy for each waste;
- adequate waste storage areas;
- residual and recyclable waste being put in appropriate bins following local authority's guidance and infrastructure; and
- transporting recyclable materials from site to a licensed facility.

9.8 Assessment Limitations and Assumptions

Limitations

9.8.1 There is a general lag in materials, landfill and waste processing capacity data in the UK. The assessment will be undertaken with the most current data available at the time, and sources of information will be clearly outlined in the EIA Materials and Waste chapter.

Assumptions

- Exact quantities of waste generated, and materials required will not be available at the stage of the EIA, hence worst-case scenario volumes will be used.
- Wastes generated during operations and that can be recycled will be estimated based on maximum capacity of the project.

- Specific waste types and volumes, and their treatment options will be available at the stage of the Project design.
- Materials required for construction are likely to change during various stages of the construction, quantities will be slightly overestimated for worst case scenario.

9.9 Cumulative Effects

9.9.1 Waste management facilities and landfill void capacity will need to consider potential use by other developments in the proximity, which could be competing for the nearest waste management infrastructures. Discussion with local authorities will be required.

10 NOISE

10.1 Introduction

10.1.1 The purpose of a noise and vibration assessment is to determine the significance of any changes in noise and vibration as a result of the Proposed Development at affected residential dwellings and other sensitive receptors. As the Proposed Development has the potential to affect ambient noise conditions in the surrounding area during the construction and operational phases, both phases will be assessed. The noise assessment will be undertaken by using baseline noise survey results and noise predictions will be carried out using International and British Standard calculation methods.

10.2 Legislation and Policy

10.2.1 Various national, regional and local legislations and planning policies are relevant to the proposed development. The following sources of legislation and guidance will be considered in the noise and vibration impact assessment: (include citations etc)

- The Noise Policy Statement for England (NPSE) [55] ;
- National Planning Policy Framework (NPPF) [4] ;
- Planning Practice Guidance – Noise (PPG-N) [56];
- British Standard BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise [57];
- British Standard BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration [58];
- British Standard BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound [59];
- British Standard BS 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting [60];
- British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration [61];
- British Standard BS 8233:2014 Guidance on sound insulation and noise reduction for buildings [62];
- Design Manual for Roads and Bridges (DMRB) LA 111 Noise and vibration- Revision 2. [63]

10.3 Baseline Conditions

10.3.1 The area around the Proposed Development is currently subject to contributions from various sources of noise, including road traffic (local and regional), and operation of nearby industrial plant, including activities at the existing KPS-B site. The area surrounding the Site is a mixture of industrial and residential / agricultural areas. The background sound environment surrounding the Main Site is predominantly influenced by road traffic during the day and industry in the evening

and night. There are various residential receptors to the west of the Main Site that could potentially be affected by the noise generated from the Proposed Development.

10.4 Receptors

10.4.1 The Main Site is situated to the east of the KPS-B plant and the nearest residential settlement is the village of East Halton. The nearest property is Fairfields on Brick Lane, approximately 900 m from the nominal centre of the Main Site and the distance to the majority of other residential receptors is around 1.2 km or more.

10.4.2 Consultation with NLC will be undertaken in order to determine specific noise sensitive receptors (NSR) and/or representative locations where baseline sound conditions need to be established and the appropriate scope of any survey.

10.4.3 Previous studies suggest that the NSRs listed in Table 10-1 and shown on Map 6-1 are representative of various residential receptor areas for assessing construction and operational noise and vibration impacts associated with the Proposed Development.

Table 10-1 Noise Sensitive Receptors Proposed for the Noise and Vibration Assessment

Noise Sensitive Receptors	Reference	Eastings/m (Approx.)	Northings/m (Approx.)
Swinster Lane	NSR 1	514320	419320
Scrub Lane (Roselea)	NSR 2	514270	419050
Brick Lane (Fairfields)	NSR 3	514640	418830
Chase Hill Road	NSR 4	514430	418210

10.4.4 The nearest ecological receptors are North Killingholme Haven Pits SSSI, which is located 1 km east of the Main Site, and the Humber Estuary SSSI, which located 1.5 km east of the Main Site.

10.5 Potential Effects

Construction

10.5.1 The precise details of the plant and techniques to be used in the construction programme are not known at this stage. However, noise and vibration generating activities taking place on the Main Site and pipeline route during the construction phase have the potential to result in significant effects at nearby receptors and will be assessed.

10.5.2 British Standard BS5228 indicates that vibration generating activities such as earthworks and impact piling do not produce significant vibrational effects at distances greater than 100 m. Since all the NSRs are much more than 100 m from the boundary of the Proposed Development, it is considered that vibration from any construction activities of the Proposed Development will not

result in a significant effect. Hence vibration from construction activities has been scoped out of the EIA.

10.5.3 Details of the extent and duration of the construction programme is not known at this stage. However, there will be additional personal and commercial vehicles accessing the Site throughout the period and this will give rise to additional movement on the public road network. The impact on local road flows will be assessed in accordance with the methodology described in Section 10.8, and the corresponding noise and vibration impacts will be assessed relative to the baseline conditions.

Operation

10.5.4 Based on the distance between the Main Site boundary and the nearest ecological receptors (more than 1 km) significant noise or vibration impacts associated with construction or operational activities are considered unlikely, and therefore impacts on such receptors have been screened out from the EIA scope.

10.5.5 Relative to the current baseline, there will only be a very small increase in traffic movements during the operational phase. A doubling in all traffic movements in the vicinity of the NSRs would give rise to 3 dB increase in noise levels. However increases in operational traffic will be considerably smaller, hence changes in the noise level which will arise from the increased operational traffic are unlikely to be significant. As such, operational traffic emissions are scoped out of the EIA.

10.5.6 A summary of the scope of the EIA for noise and vibration effects during construction and operational phases is given in Table 10-2.

Table 10-2 Potential Noise and Vibration Effects Scoped Into the EIA.

Project Phase	Effects	Scoped In / Out	Justification
Construction	Noise from activities on site and along pipeline routes	In	
	Noise and vibration from construction traffic on public roads	In	
	Vibration from activities on site and along pipeline routes	Out	Distance to receptors
Operation	Noise from Proposed Development	In	
	Vibration from Proposed Development	Out	Distance to receptors
	Noise and vibration from operation traffic on public roads	Out	Low number of additional journeys

10.6 Determination of Significance

10.6.1 The criteria for assessment of noise and vibration effects during the construction and operational phases of the Proposed Development will be agreed with NLC Environmental Health departments, however, it is proposed that the following criteria be adopted.

Construction

10.6.2 It is proposed to follow Example Method 1 – The ABC method outlined in BS 5228-1:2009+A1:2014 - Code of practice for noise and vibration control on construction and open sites (BS 5228) for thresholds for magnitudes and significance. This method provides criteria above which potential significant effects may occur and is reproduced in Table 10-3. This may be adjusted based on contextual factors.

Table 10-3 Criteria for determining significance of Construction Noise effects – ABC method

Threshold of Significant Effect of Noise at Dwellings	Threshold Value dB		
	Category A	Category B	Category C
Night-time (23:00 – 07:00)	45	50	55
Evening and weekends #	55	60	65
Daytime (07:00 – 19:00) and Saturdays	65	70	75
Notes A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level. If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise.			
Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values. Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values. # 19.00–23.00 weekdays, 13.00–23.00 Saturdays and 07.00–23.00 Sundays.			

10.6.3 It is proposed that the criteria set out in Table 10-4 are used for the assessment of impact magnitude, and contextual factor taken into account in determining the overall significance. In the absence of any contextual adjustments the significance of the impacts above would correspond to Negligible, Minor, Moderate and Major (ordered from Negligible to High, see Table 3-1.

Table 10-4 Construction Noise Impact Magnitude Criteria – ABC method

Impact Magnitude	Description
High	Greater than 5 dB above the threshold value
Medium	Between 0 and 5 dB above the threshold value
Low	Between 0 and 5 dB below threshold value
Negligible	Greater than 5 dB below the threshold value

10.6.4 Changes in road traffic noise during the construction phase of the Proposed Development will be calculated using the methodology outlined in the Construction of Road Traffic Noise (CRTN) methodology [64]. The significance of changes will be assessed based on a range of relevant guidance including the DMRB.

Operation

10.6.5 The predicted rating noise level from the Proposed Development will be compared to the baseline sound levels, in accordance with the standard BS 4142:2014+A1:2019 – Methods for rating and assessing industrial and commercial sound (BS 4142). It is proposed that the criteria set out in Table 10-5 are used for the assessment of impact magnitude, and contextual factor taken into account in determining the overall significance.

Table 10-5 Operational Noise Impact Magnitude Criteria

Impact Magnitude	Description
High	A rating level greater than 10 dB above background
Medium	A rating level greater than 5 dB above background
Low	A rating level between 0 and 5 dB above background
Negligible	A rating level equal to or lower than background

10.6.6 NSRs will initially be assumed to be of medium sensitivity since the BS 4142 approach is specific to assessing impacts on residential receptors. In the absence of any contextual adjustments the significance of the impacts above would correspond to Negligible, Minor, Moderate and Major (impacts ordered from Negligible to High), see Table 3-1.

10.7 Mitigation

Construction

10.7.1 Best practical means will be employed to control the noise generation, as follows:

- Restriction of construction hours;

- Careful choice of piling rigs to minimise noise;
- Avoiding unnecessary plant operation and revving of plant or vehicles;
- Locating plant away from nearest sensitive receptors or in locations that provide good screening in the direction of sensitive receptors;
- Use of broadband noise reverse alarms (where practicable) on mobile plant;
- Careful handling of materials used in construction processes to avoid unnecessary noise;
- Use of appropriate noise silencing / noise reducing equipment for noisy elements of plant; and
- Ensuring plant and machinery are serviced and well maintained.

Operation

10.7.2 Where appropriate, the individual noise contributions from the main noise sources on site will be assessed against relevant impact criteria. Particular attention will be paid to sound emissions from outdoor plant, such as building ventilation, process cooling plant, electrical equipment and vents. Focussed noise control measures will be considered to ensure that overall noise levels are within relevant noise criteria guidance. Recommendations for appropriate noise control will be detailed taking BAT into consideration.

10.8 Proposed Assessment Methodology

Guidance

10.8.1 For the construction phase the Control of Pollution Act 1974 (CoPA), The Environmental Protection Act 1990 and BS 5228 are of particular relevance to noise and vibration generated. CoPA provides Local Authorities with powers to control noise and vibration from construction sites. Section 60 of CoPA allows a Local Authority to specify how site noise could be controlled, which may include restrictions on hours, allowable plant/activities and emission limits. Section 61 of CoPA allows a developer to apply to the Local Authority for advanced consent to carry out the works based on noise and vibration control measures that will be implemented. BS 5228 is the code of practice for noise and vibration control on construction sites and contains recommendations on appropriate physical and management measures to be implemented.

10.8.2 The NPPF, the NPSE and BS 4142 are of particular relevance to noise generated by the operational phase of the Proposed Development.

10.8.3 The NPPF sets out the Government's planning policies for England and avoiding noise giving rise to significant adverse effects on health and quality of life as a result of new development. The NPSE sets out the role and purpose of noise policy, together with the Government's Noise Policy Vision and Aims, consistent with the NPPF.

10.8.4 The key paragraph 2.24 of the NPSE states that in relation to minimising and mitigating adverse effects:

"…all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur."

10.8.5 The NPSE identifies noise effect levels as follows:

- No Observed Effect Level (NOEL) – the level below which no effect can be detected. Below this level, there is no detectable effect on health and quality of life due to the noise;
- Lowest Observed Adverse Effect Level (LOAEL) – the level above which adverse effects on health and quality of life can be detected, but are not necessarily significant; and
- Significant Observed Adverse Effect Level (SOAEL) – This is the level above which significant adverse effects on health and quality of life occur.

10.8.6 BS 4142 describes methods for rating and assessing sound in order to provide an indication of its likely effect upon nearby residential dwellings (Noise Sensitive Receptors)

10.8.7 An indication of the likely noise effect at a NSR is given by assessing the magnitude of the rating level for the site development compared to the existing prevailing background LA90 sound level. The rating level is the specific sound level contribution from the site adjusted for any distinct aural character, i.e. tonality, impulsivity, intermittency. The level by which the rating level exceeds the prevailing background sound level indicates the following potential effects:

- a difference of 10 dB or more is likely to be an indication of a significant adverse effect, depending on the context;
- a difference of around 5 dB is likely to be an indication of an adverse effect, depending on the context; and
- where the rating level does not exceed the background level, this is an indication of the specific sound source having a low effect, depending on the context.

Consultation

10.8.8 The Environmental Health Officer (EHO) at NLC will be consulted as part of the noise assessment to determine specific NSRs and/or representative locations for determining baseline sound. They will also be consulted regarding the significance criteria to be used in the assessment.

Scope and Methodology

10.8.9 Baseline sound monitoring requirements will be agreed in advance with NLC. The monitoring procedures will conform to BS 7445: 2003 'Description and Measurement of Environmental Noise' [65]. The monitoring will take place at locations that are representative of NSRs and continuously quantify the sound level over several days to allow identification of typical and representative sound levels. The results shall be used in conjunction with sound level data from other sources (previous surveys, assessments for other assessments) to determine representative baseline background LA90 and residual LAeq,T levels.

10.8.10 Noise levels associated with construction activities will be estimated at NSRs in accordance with the BS 5228-1 methodology. Increases in noise at NSRs due to any construction traffic on public roads will be calculated according to the methods given in CRTN. The predictions will be based

on baseline and with-development traffic flows estimated in the Traffic and Transportation assessment (See section 12).

10.8.11 The impact from the Proposed Development's operation will be predicted using the IMMI noise modelling software, in accordance with the ISO 9613-2 methodology [66]. The model will take into account: the plant layout; the noise emissions from the plant items; break-out noise from plant buildings; and effects arising from other building structures and ground features. The results from the modelling will be assessed against the baseline noise monitoring for day, evening and night time operation of the Proposed Development.

10.8.12 Where appropriate, the individual noise contributions from the main noise sources on site will be assessed against relevant impact criteria. Focused noise control measures will be considered to ensure that overall noise levels are within relevant noise criteria guidance. Recommendations for appropriate noise control will be detailed taking BAT into consideration.

10.8.13 Construction noise will be examined by considering the noisiest processes within each phase of the works and the duration of any resulting noise or vibration effects. The guidance in BS 5228-1 and BS 5228-2 Code of Practice for Noise and Vibration Control on Open Construction Sites will be refer. If required, noise mitigation measures will be recommended in order to adequately manage the noise impacts of the construction onto the nearest sensitive receptors.

10.8.14 Construction road traffic noise will be assessed based on the approach for noise impact assessment set out in the DMRB, LA 111 [63]. Changes in traffic noise through trip generation during operation will be forecast using the CRTN methodology.

10.9 Cumulative Effects

10.9.1 The potential cumulative impact from noise during the construction and operational phases of the Proposed Development will be assessed in the context of the other approved or planned projects given in section 3.6.

11 LANDSCAPE AND VISUAL AMENITY

11.1 Introduction

11.1.1 This section sets out the scope and level of detail which is considered to be proportionate for the Landscape & Visual Impact Assessment (LVIA) given the scale and nature of the Proposed Development and site context.

11.1.2 Although linked, landscape and visual effects are considered separately. Landscape effects derive from changes in the landscape fabric, which may result in changes to the character, whereas visual effects are the effect of these changes as experienced by people (visual receptors). Landscape and visual effects are also classified into two categories, those experienced during the construction and decommissioning phases (temporary or short term) and those during the operational phase of the Proposed Development (long term).

11.1.3 Effects on the setting of any heritage assets are not dealt with as part of the proposed LVIA.

11.1.4 An initial site visit was undertaken by the Landscape Architect in March 2023 as part of a previous application by Uniper for a blue hydrogen development. Observations made during that site visit were based on much taller infrastructure than what is proposed for this project. Details on the study area and potential visibility are addressed in 11.4 below.

11.1.5 The exact details of the Proposed Development are not yet fixed, but the provisional site boundary is shown on the following Maps:

- Map 11-1 Site Location,
- Map 11-2 Site Context,
- Map 11-3 Topography and Landcover,
- Map 11-4 Landscape Character; and
- Map 11-5 Initial standard screening ZTV and Proposed Viewpoints.

11.2 Legislation and Policy

11.2.1 As detailed in Section 4.5, the Development Plan for North Lincolnshire comprises the North Lincolnshire LDF, including the Core Strategy (adopted June 2011), and the ‘Saved Policies’ of the North Lincolnshire Local Plan.

11.2.2 The LVIA will consider relevant landscape planning policy in the North Lincolnshire Core Strategy 2010 (adopted June 2011) and saved policies of the North Lincolnshire Local Plan (2003), from which the following supplementary planning guidance will be reviewed:

- SPG2 Industrial Development [23]
- SPG5 Landscape Character Assessment and Guidelines [67]

11.3 Baseline Conditions

Study Area

11.3.1 Best practice guidance (Guidelines for Landscape and Visual Impact Assessment, Third Edition GLVIA 3) states:

'Scoping should also identify the area of landscape that needs to be covered in assessing landscape effects. This should be agreed with the competent authority, but it should also be recognised that it may change as the work progresses, for example as a result of fieldwork, or changes to the proposal. The study area should include the site itself and the full extent of the wider landscape around it which the proposed development may influence in a significant manner.'

And:

'Scoping should identify the area that needs to be covered in assessing visual effect, the range of people who may be affected by these effects and the related viewpoints in the study area that will need to be examined. The study area should be agreed with the competent authority at the outset and should consider the area from which the proposed development will potentially be visible. The emphasis must be on a reasonable approach which is proportional to the scale and nature of the proposed development.'

11.3.2 The site lies within a primarily flat industrial landscape containing many large-scale vertical features. The tallest feature within the site is currently indicated as being 27m and based on preliminary desk-based analysis and observations made during the site visit, an initial study area of 10km offset from the site has been used for the Zone of Theoretical Visibility (ZTV). The ZTV is presented on Map 11-5.

11.3.3 In practice, significant landscape and visual effects are more likely to occur within 3-5km of the site and the focus of the LVIA will be in this area; Maps 11-1 to 11-4 are based on a 5km study area. A wider study area of 10km, as shown on the ZTV, will be surveyed to ensure all likely significant effects are identified and assessed.

Baseline and Future Baseline

11.3.4 The landscape and visual baseline for the LVIA will be taken to be the existing situation including any development under construction at the time the assessment is undertaken.

11.3.5 The landscape changes over time as new development is introduced, vegetation matures or is cleared and trees felled. Predicting a future baseline involves a degree of speculation and uncertainty as acknowledged in GLVIA3 paragraph 5.33.

11.3.6 This LVIA will therefore consider the potential effects of the Proposed Development at Year 1 and Year 10 with the assessment of effects at Year 10 considering any likely change to the baseline during that time that may have a bearing on significance of effect.

Baseline Conditions

Landscape Character

11.3.7 The LVIA will draw upon information in the following landscape character assessments:

- National Character Area (NCA) Profile 41: Humber Estuary [68]
- The Historic Landscape Characterisation Project for Lincolnshire (2011) [69]
- North Lincolnshire Landscape Character Assessment and Guidelines (1999) [67]
- North East Lincolnshire Landscape Character Assessment, Sensitivity and Capacity Study (2015) [70]
- West Lindsey Landscape Character Assessment (1999) [71]

11.3.8 At both national and local level, the Proposed Development lies wholly within a character area defined as Humber Estuary.

11.3.9 On a local level, the site is within the Humber Estuary Landscape Character Area which is described in detail within the North Lincolnshire Landscape Character Assessment. Effects may also extend into neighbouring character areas which are shown on Map 11-4.

Landscape Designations

11.3.10 The Lincolnshire Wolds National Landscape is approximately 15km to the southeast of the site. Observations made during the site visit confirmed that given the intervening distance from the site there would be no views of the Proposed Development from within the Lincolnshire Wolds. It is therefore proposed to scope the Lincolnshire Wolds National Landscape out of the LVIA.

11.3.11 The northern edge of Brocklesby Park, a Registered Park and Garden (RPG), is approximately 5km to the south-west of the site with the remaining part of this RPG extending southwards for a further 10km. Although there is some scattered visibility indicated on Map 11-5, observations made during a previous site visit confirmed that there would be no views of the site from Brocklesby Park. It is therefore proposed to scope Brocklesby Park out of the LVIA.

11.4 Receptors

Preliminary Appraisal of Potential Visibility

11.4.1 A ZTV showing the theoretical extent of visibility of the Proposed Development is presented on Map 11-5. The ZTV takes account of the screening effect provided by blocks of woodland and buildings but not hedgerows or individual trees.

11.4.2 The ZTV shows the theoretical visibility of three vents at a height of 27m and assumes that these are located to the north, south and in the middle of the provisional site boundary.

11.4.3 Topography is primarily flat within 5km of the site boundary, and as shown on Map 11-3, the landform rises gently westwards towards Wootton and Ulceby to a height of approximately 30m

AOD. The landform continues to rise in this direction to approximately 50m AOD around 10km from the site boundary.

11.4.4 Visibility inside the 5km radius, as indicated on Map 11-5, is primarily limited to areas immediately around the site. Actual visibility at ground level will be less due to the presence of hedges and small areas or belts of woodland that are not included in the terrain model on which the ZTV is based.

11.4.5 Visibility to the south of the site is limited, with no visibility indicated around South Killingholme. Suggested visibility beyond the M180 is scattered and around 5km from the site there is a greater presence of woodland blocks within this landscape which screens and breaks up any potential views. As described in 11.3.11, Brocklesby Park is located in this part of the study area but there would be no visibility from this RPG.

11.4.6 As part of the previous consultation process, North Lincolnshire Council requested inclusion of a viewpoint from a section of Rosper Road, south-east of the site, which will form part of the proposed route of the King Charles III England Coast Path. Although no visibility is indicated from this location it would be surveyed as part of the subsequent site work. The proposed route of the King Charles III England Coast Path will overlap with the existing Public Rights of Way (PRoW) network which includes a section of Footpath 50 which runs to the east of Killingholme Marshes along the edge of the Humber Estuary. As indicated in Table 11-1, Viewpoint 4 will be taken from this location.

11.4.7 Based on observations made during the site visit, views from the opposite side of the Humber Estuary to the north, north-east and east are from low-lying landform and would be between 6 and 10km from the site. Although infrastructure within the existing industrial area is discernible the Proposed Development would not be distinguishable within the view. It is therefore proposed to scope out of the LVIA receptors from the opposite side of the Humber Estuary and any within the Estuary itself.

11.4.8 As stated previously, an initial 10km study area will be used and surveyed during fieldwork. It is anticipated that significant effects on landscape and visual receptors are more likely to occur within 5km of the Proposed Development and that is where the focus of the survey and assessment effort will be.

11.4.9 On that basis the following key visual receptors will be assessed:

- Recreational users of North Lincolnshire Public Rights of Way within 5km
- Settlements within, and around the 5km radius, including East Halton, North Killingholme and Ulceby
- Local road users

11.4.10 The ZTV was used to select preliminary viewpoints proposed as shown on Map 11-5 and detailed in Table 11-1

11.4.11 It is proposed that the LVIA will be illustrated using annotated photographs (Landscape Institute Type 1 visualisation) for each viewpoint.

Table 11-1 Proposed Assessment Viewpoints

Viewpoint	Location	Receptor Represented
1	Chase Hill Road	Road users
2	Footpath 74, east of East Halton	Residents in East Halton and PRoW users
3	Footpath 50, East Halton Skitter (part of the proposed route for the King Charles III England Coast Path)	PRoW users
4	Footpath 50, Killingholme Marshes (part of the proposed route for the King Charles III England Coast Path)	PRoW users
5	Church Lane, North Killingholme	Road users and residents in North Killingholme
6	Unnamed local road to the west, south-west of Thornton Abbey	Local road and recreational users
7	A1077, south of Wootton	Road users
8	Race Lane, south of Burnham; part National Cycle Network route 1	Local road and recreational users

11.5 Potential Effects

11.5.1 The LVIA will consider the potential effects upon:

- Landscape fabric and landscape character; and
- Visual receptors including residential, transport and recreational receptors.

11.5.2 It is proposed that the effects of lighting during the construction and operational phases are scoped out of the LVIA. Any effects of lighting would be localised and mitigated to a degree using industry standard approaches to avoid incidences of light spill and obtrusive lighting. It is therefore proposed that the LVIA would not include a night-time assessment as the Proposed Development is not uncharacteristic of the locality and effects of lighting can largely be mitigated or would be infrequent and of short duration.

Construction

11.5.3 Effects that may arise during construction include changes to existing components, such as temporary alterations to landform and access routes, as well as laydown and material storage areas and installation, or construction, of temporary built structures such as welfare cabins. There may also be noise and disruption caused by earthworks from plant equipment and any other activities/infrastructure associated with construction. Works may be visible where existing views

are permitted into the site. Vegetation may be removed to accommodate the construction of the Proposed Development.

Operation

11.5.4 Effects that may arise during operation include visibility of the vents. If the pipeline corridors are buried they should not be fully visible, although there would be changes to the landscape to accommodate said infrastructure. If above ground, the pipelines will have a low profile and

11.5.5 There may also be visibility of overhead power cables, new buildings, welfare and parking facilities. Existing landscape components, such as vegetation, may be removed to accommodate the Proposed Development.

11.6 Determination of Significance

11.6.1 Sensitivity is judged as taking into account the component judgments about the value (National, Regional, Community) and susceptibility (High-Low) of the receptor. Where sensitivity is judged to lie between levels, an intermediate assessment will be adopted. A slightly greater weight is given to susceptibility in judging sensitivity of visual receptors.

11.6.2 Scale of effect is the primary factor in determining magnitude, which may be higher if the effect is particularly widespread and/or long lasting, or lower if it is constrained in geographic extent and/or timescale. This judgement is considered as a two-step process. Where magnitude is judged to lie between levels, an intermediate assessment will be adopted.

11.6.3 Once the sensitivity of the receptor and the magnitude of change have been identified, these are considered together to determine whether the resultant effect is significant or not. The level of effect that would occur is determined guided by the matrix shown in Table 3-1.

11.6.4 Landscape and visual effects can be beneficial or adverse and, in some instances, may be considered neutral. Neutral effects are those which overall are neither adverse nor positive but may incorporate a combination of both. Whether an effect is beneficial, neutral or adverse is identified based on professional judgement. GLVIA3 indicates at paragraph 2.15 that this is a “particularly challenging” aspect of assessment, especially in the context of a changing landscape.

Table 11-2 Potential Effects Scoped out of the LVIA

Landscape & Visual Amenity	Effect	Scoped In or Out	Justification
Construction	Effects on designated and designed landscapes	Scoped out	The Proposed Development would not be visible from within the Lincolnshire Wolds National Landscape or Brocklesby Park RPG
Operation	Effects on designated and	Scoped out	The Proposed Development would not be visible from

	designed landscapes		within the Lincolnshire Wolds National Landscape or Brocklesby Park RPG
Construction	Effects of lighting	Scoped out	Lighting would not be uncharacteristic of the locality and would be localised and mitigated to a degree using industry standard approaches to avoid incidences of light spill and obtrusive lighting
Operation	Effects of lighting	Scoped out	Lighting would not be uncharacteristic of the locality and would be localised and mitigated to a degree using industry standard approaches to avoid incidences of light spill and obtrusive lighting

11.7 Mitigation

11.7.1 A landscape and visual amenity mitigation strategy will be developed which will be complimentary to the ecological and other environmental mitigation requirements. The assessment of effects will take all proposed mitigation into account cognisant of the establishment period for any new planting.

Construction

11.7.2 Construction effects on landscape and visual receptors will be temporary and of short duration. However, there is scope to mitigate effects on landscape and visual amenity through the use of a shorter construction period and through the use of boundary treatment around the site to screen ground level construction activities.

11.7.3 Temporary screen bunds or fencing may be an option to mitigate the landscape and visual effects on the wider area during this phase. Existing woodland blocks close to the site may provide screening of certain views into site.

Operation

11.7.4 Due to the height of the vents, they will be a visible element of the Proposed Development which would not be screened by planting in views from immediately around the site. Planting around the site boundary would filter views from medium and longer range views. The colour and finish of the vents could potentially reduce effects and will be a consideration during design.

11.7.5 Planting could be considered as a means of screening lower-level built elements, such as new buildings, any sections of above ground pipelines, welfare and parking facilities. If buried, the

pipeline corridors would not be visible. Where retained, existing woodland blocks close to the site may provide screening of certain views into site.

11.8 Proposed Assessment Methodology

Baseline Assessment

11.8.1 The initial phase of the LVIA will be informed by desk study and a site visit. Geographic Information System (GIS) mapping software will be used to create Maps, Figures and ZTVs. Annotated photographs will be used to illustrate how the Proposed Development would fit within the existing landscape.

Guidance

11.8.2 The LVIA will be informed by the following best practice guidance:

- Guidelines for Landscape and Visual Impact Assessment, (Third Edition) (2013) [72],
- Technical Guidance Note 06/19: Visual Representation of Development Proposals (2019) [73].

Consultation

11.8.3 No consultation with North Lincolnshire Council has been undertaken as part of developing the proposed LVIA scope for the Proposed Development.

11.8.4 Based on previous consultation with North Lincolnshire Council, as part of the blue hydrogen development, it is anticipated that as part of any consultation for this Proposed Development the following key aspects would be discussed:

- The LVIA photographic viewpoint locations (see Map 11-5),
- The requirement for the production of any photomontages.

Scope and Methodology

11.8.5 The LVIA will consider the effects of the Proposed Development in the following two phases:

- Construction: considering the short term/temporary effects during the construction phase of the development.
- Operation: considering the residual long term effects during the operational phase of the development with all mitigation measures taken into account and fully established.

11.8.6 It is considered that effects arising from the decommissioning phase are unlikely to be greater than those during construction and it is proposed to scope this phase out of the LVIA.

11.8.7 Predicted changes in both the physical landscape and landscape character will be identified. Effects will be considered in terms of the magnitude and type of change to the landscape, including its key characteristics as set out in published landscape character assessments. The

sensitivity of the landscape will also be taken into account, acknowledging value placed on the landscape through designation, and the presence of other similar industrial development. The magnitude of the effect will be assessed in terms of the size and scale, geographical extent, duration and reversibility of the effect. These aspects will all be considered, to form a judgement regarding the overall significance of effect.

11.8.8 Visual effects are experienced by people at different locations around the study area, at static locations (for example settlements or viewpoints) and from sequential locations when travelling along routes. Visual receptors are the people who will be affected by changes in views at these places. Assessment of the visual effects of the Proposed Development will be based on considerations of the sensitivity of visual receptors to changes to the view and analysis of the ZTVs, field studies and assessment of representative viewpoints.

11.8.9 The level of impact and the resultant 'significance' of the Proposed Development on the baseline resource will be based upon the correlation between the magnitude of change and the sensitivity of the receptor.

11.8.10 The LVIA will be supported by plans, ZTVs and annotated photographs as appropriate including a final version of the proposed site plan.

11.8.11 The LVIA will be organised in the following sections:

- Scope of the LVIA,
- Methodology and Criteria - an outline of the general methodology employed in the LVIA, with reference to established guidance,
- Policy: an outline of the local planning policies which are relevant to the LVIA,
- Baseline description – to identify, confirm and evaluate the key landscape elements/features/characteristics of the landscape surrounding the proposal,
- Project description and mitigation – a description of the Proposed Development which has the potential to give rise to landscape and/or visual effects, and the measures which have been incorporated into the project design to mitigate these potential effects,
- Landscape effects – an assessment of the effects arising from the Proposed Development (against the baseline) on the landscape fabric, landscape character and quality of the landscape types within the study area,
- Visual effects – an assessment of the effects arising from the proposed d Proposed Development envelopment (against the baseline) on the visual amenity of receptors within the study area; and
- Summary and conclusions – a summary of the assessment results.

11.9 Assessment Limitations and Assumptions

11.9.1 There are no limitations known to the assessment method and no assumptions that are already known.

11.10 Cumulative Effects

11.10.1 The cumulative assessment will consider the developments listed in section 3.6. These sites will be considered as the cumulative baseline. The LVIA will assess the effects arising from addition of the Proposed Development to the cumulative sites as opposed to the combined effects of the Proposed Development and all cumulative sites on receptors. The focus of the cumulative assessment will be on those receptors identified as experiencing significant effects of the Proposed Development alone.

12 TRAFFIC AND TRANSPORT

12.1 Introduction

12.1.1 This section presents information about the potential environmental impacts that could result from traffic generated by the construction and operation of the Proposed Development.

12.1.2 An ES transport chapter will be prepared to provide the information necessary for assessment of the Proposed Development through the EIA process. It will refer to the construction stage and then operational stage of the site and the likely traffic numbers and vehicle movements associated with them. This data and the resulting forecasts will be based on the most accurate information available at the time of writing.

12.1.3 The chapter will be prepared by RSK's transport planning team who have considerable experience of working on energy production and storage schemes, including hydrogen production schemes in Manchester, Plymouth and Cumbria. The team have dealt with a wide range of EIA-related development and have expertise across the UK to assess the environmental impacts and prepare relevant chapters to support a planning application.

12.2 Legislation and Policy Context

12.2.1 A summary of relevant local and national transport and planning policy and guidance that will be used in the emerging EIA process is provided below. The traffic and movement assessment will be carried out in accordance with the relevant legislation, guidance and policy documentation including the following:

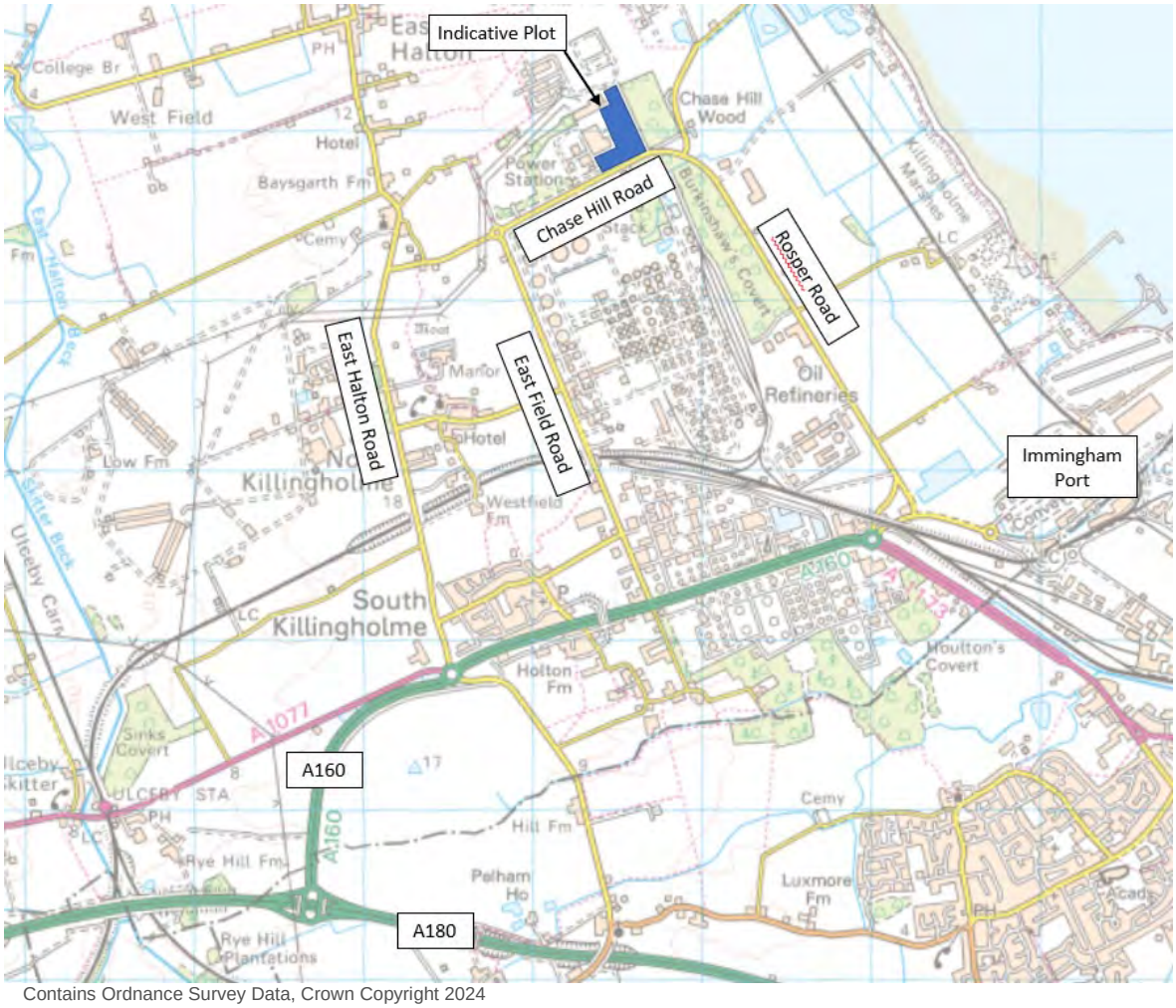
- National Planning Policy Framework (NPPF) 2023 [4];
- Assessment of Traffic and Movement, IEMA, 2023 [74];
- Design Manual for Roads and Bridges (DMRB), LA 104 Environmental assessment and monitoring, 2020 [75]; and
- Guidelines for Traffic Impact Assessment, Institution of Highways and Transportation (IHT), 1994 [76].

12.3 Baseline Conditions

12.3.1 This section will describe the existing environment in relation to Traffic and Transport in proximity to the Proposed Development.

Surrounding road network

12.3.2 The surrounding road network is shown in Figure 12-1. Construction and operational traffic is likely to arrive from either the strategic road network or Immingham Port. The A180 is a dual carriageway to the south of the Proposed Development and forms part of the strategic road network under the responsibility of National Highways.



Contains Ordnance Survey Data, Crown Copyright 2024

Figure 12-1 Local Road Network

12.3.3 The A160 provides a dual carriageway link between the A180 and Immingham Port to the east. It also leads to a variety of industrial areas, including oil refineries. South Killingholme is mostly located to the north of the A160 with a small number of properties to the south, linked by a road bridge over the A160.

12.3.4 East Halton Road connects with the A160 at a roundabout and leads north to East Halton. North Killingholme is on the east side of East Halton Road with an area of employment to the west. A small number of residential properties have frontage onto the road and there is a shared footway/cycleway along the eastern side. The road varies in speed limit between 40 mph and 50 mph and does not have street lighting. It is also subject to a 7.5 tonne weight restriction.

12.3.5 Parallel to East Halton Road, East Field Road connects with the A160 at a traffic signal controlled junction. Travelling north, it serves a number of distribution businesses and an oil refinery. The road is subject to a 40 mph speed limit, offers intermittent footway provision and benefits from street lighting along its length.

12.3.6 Further east and again parallel to East Halton Road and East Field Road, Rosper Road connects with the A160 via a gyratory around a fire station and roundabout just south of a railway line. The road primarily serves large container and parking areas for the Killingholme Port and Automotive

Terminal to the east. The road is subject to a 40 mph speed limit and does not offer footway provision or street lighting along its length. At its northern end, the road bends towards the west, becoming Chase Hill Road.

12.3.7 Chase Hill Road is subject to a 40 mph speed limit on a single carriageway road. It runs east to west immediately south of Killingholme Power Station and connects to East Halton Road and East Field Road. To the west of East Field Road there is a 7.5 tonne weight restriction. There are no footways or street lighting in the vicinity of the site.

Site access

12.3.8 The Proposed Development adjoins the Killingholme Power Station, which benefits from an access point from Chase Hill Road. Upon entry, the road turns north east to serve the Main Gatehouse. Access to the Proposed Development will be provided via the same entry/exit onto Chase Hill Road and vehicles will have to pass through the existing gatehouse. Car parking will be provided within the site, encompassing a small number of spaces. This reflects the proposed workforce and the requirements for shift changeover of a 24/7 facility where a higher demand is required for a short period of time.

12.3.9 All construction and operational traffic will access the site from this existing access from Chase Hill Road, which will continue to serve the Killingholme Power Station.

12.3.10 It is anticipated that heavy goods vehicle (HGV) construction traffic for the hydrogen plant will route from the A180 onto the A160 and then along East Field Road before turning onto Chase Hill Road to reach the site. Exiting traffic would turn left onto Chase Hill Road and follow the continuation as Rosper Road to return to the A160 and A180. These arrangements offer a left in / left out for HGVs and avoid potentially sensitive residential receptors along East Halton Road for the main construction works. This would be agreed with the relevant highway authorities and secured through a Construction Traffic Management Plan.

12.3.11 The construction of the pipeline will require a relatively low volume of traffic, following the possible pipeline route alongside either Rosper Road or East Halton Road to reach the oil terminal. Construction traffic will utilise a haul road alongside the pipeline within the Proposed Development boundary, minimising potential disruption to other users and sensitive receptors.

Walking and cycling

12.3.12 Due to the rural nature of the Proposed Development, the propensity for walking and cycling is considered to be low. There are no existing dedicated walking and cycling facilities in close proximity to the site access, with the nearest segregated walking route approximately 1 km to the west along East Halton Road. There are no National Cycle Network (NCN) routes located near to the site while there is a Public Right of Way to the west and north of the Proposed Development, outside of the site boundary.

12.3.13 Considering the nature of the development proposals, it is not considered that access to the site will be required on foot or by bicycle.

Accident analysis

12.3.14 Review of the most recent 5-year reported accident statistics has been undertaken considering a search area encompassing Chase Hill Road within 500 m of the site frontage. There have been no reported incidents within this area and therefore it is considered that there are no highway safety concerns in the locality.

12.4 Receptors

12.4.1 Sensitive receptors that relate to transport are typically associated with vulnerable users, such as pedestrians, cyclists, children and elderly persons. These can include schools, hospitals, care homes and large public areas. Consideration should also be given to footways alongside roads, such as narrow footways or where there are no footways yet there is likely to be a pedestrian demand.

12.4.2 For the purposes of the assessment, the majority of the routes in the vicinity of the site are not considered as 'sensitive' as they are not located in a residential area, nor is there potential for high volumes of pedestrian and cycle movements within the area. However, there is the potential for some sensitive receptors to be located along East Halton Road where a small number of residential properties are present and pedestrians may be encountered in the vicinity as well as travelling north-south between East Halton and North / South Killingholme.

12.5 Potential Effects

Construction

12.5.1 The main potential impacts are related to the site access and increase in construction traffic. The traffic and transport impact assessment during construction will therefore analyse the expected changes in traffic levels during the construction period before considering the level of impact expected on both of these elements.

12.5.2 Consideration of the environmental impacts of construction traffic will be undertaken in relation to:

- Severance of communities
- Road vehicle driver and passenger delay;
- Non-motorised user delay;
- Non-motorised user amenity;
- Fear and intimidation on and by road users;
- Road user and pedestrian safety; and
- Hazardous/large loads.

12.5.3 These effects are defined in Table 12-2.

Operation

12.5.4 The number of staff required during the operational stage of the Proposed Development has not yet been determined, although it is anticipated that there will be will a maximum of around 40 staff on site at any given time with shift working taking place. The Proposed Development will require limited HGV movements on a daily basis and may require occasional maintenance.

12.5.5 Operational traffic will be limited and at a much lower level than during the construction phase, for this reason it is proposed to scope out the operational phase as it is unlikely to result in significant impacts.

12.6 Determination of Significance

Screening process

12.6.1 Assessment of the traffic and transport environmental impacts and their significance will be based on the Guidelines for the Environmental Assessment of Traffic and Movement [74] This guidance provides two broad rules to be used as a screening process to identify the appropriate extent of the assessment area and likelihood of impacts. These are:

- ‘Rule 1 – Include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%)’.
- ‘Rule 2 – Include highway links of high sensitivity where traffic flows have increased by 10% or more.’

12.6.2 Given that the day-to-day variation of traffic on a road is frequently at least plus or minus 10%, where the predicted increase in traffic flow is lower than the thresholds, the guidelines suggest the significance of the effects can be stated to be low or insignificant and further detailed assessments are not warranted and as such, will be scoped out of the environmental assessment.

Sensitivity of receptors

12.6.3 The sensitivity of links is based on a qualitative assessment of the baseline scenario, taking into consideration of the importance of the route and the destinations served. The thresholds are based on professional judgement and defined based on IEMA 2023 guidelines in Table 12-1.

Table 12-1 Sensitivity of receptors

Sensitivity	Definition
Negligible	Receptors with negligible sensitivity to change in traffic flows including motorways and dual carriageway and/or land uses sufficiently distant from affected routes and junctions.
Low	Receptors with low sensitivity to change in traffic flows: places of worship, public open space, nature conservation areas, listed buildings, tourist/visitor attractions and residential areas with adequate footway provision.

Medium	Receptors of medium sensitivity to change in traffic flows: congested junctions, doctor's surgeries, hospitals, shopping areas with roadside frontage, roads with narrow footways, unsegregated cycle ways, community centres, parks and recreation facilities.
High	Receptors of high sensitivity to change in traffic flows: schools, colleges, playgrounds, collision clusters, retirement homes and urban/residential homes without footways that are used by pedestrians and cyclists.

12.6.4 In accordance with the IEMA guidelines, where the sensitivity of a road link is judged as high or medium, Rule 2 will be applied and where traffic flows are predicted to increase by 10% or more, an assessment of environmental effects will be undertaken. Where the sensitivity is judged as low or negligible, Rule 1 will be applied and where traffic flows are predicted to increase by more than 30%, or where the number of HGVs is predicted to increase by more than 30%, an assessment of environmental effects will be undertaken of the road link.

Magnitude of Impact

12.6.5 The IEMA guidelines [74] state that the magnitude of each impact should be determined as the predicted deviation from the baseline conditions. The guidelines also set out criteria by which the magnitude of impact can be measured. Many of the criteria do not provide specific thresholds by which such impacts can be measured, and as a result will be measured qualitatively, where necessary. These are described in Table 12-2.

Table 12-2 Potential Traffic Effects and IEMA Guidance on Significance

Effect	Definition and Guidance
Severance	Defined as the 'perceived division that can occur with a community when it becomes separated by a major traffic artery'. The term is used to describe a complex series of factors that separate people from places and other people. Severance may result from the difficulty crossing a heavily trafficked road or a physical barrier created by the road itself. It can also relate to quite minor traffic flows if they impeded pedestrian access to essential facilities. The IEMA guidelines (2023) suggest that a 30%, 60% and 90% change in traffic flows will result in a low, medium, and high change in severance respectively.
Road vehicle driver and passenger delay	Traffic delays impacting non-development traffic can occur at points on the road network surrounding a development site including: the site entrance, highways passing the development site, key intersections along the highway and side roads where availability of gaps to circumvent delay are reduced. This will be assessed qualitatively. Traffic management measures will also be taken into account in terms of their impact to driver delay.
Non-motorised user delay	Changes in volume, composition or speed of traffic may affect the ability of people to travel across road links. In general, increases in traffic levels are likely to lead to greater increases in delay. This is also dependent on existing level of activity, visibility and conditions. The IEMA guidance (2023) estimates that an increase in total hourly traffic of approximately 30% can double the delay experienced by pedestrians attempting to cross a road. Whether or not the increase in traffic results in a significant effect should be determined using professional judgement.
Non-	Defined as the relative pleasantness of a journey, and is considered to be affected by

motorised user amenity	traffic flow, traffic composition and pavement width/separation from traffic. The IEMA guidelines (2023) note that pedestrian amenity is affected when traffic flow is halved or doubled.
Fear and intimidation on and by road users	Is dependent on the volume of traffic, its HGV composition, and its proximity to people or that lack of protection caused by such factors as narrow pavement widths. The IEMA guidance (2023) requires the calculation of a degree of hazard score.
Road user and pedestrian safety	Consists of an approximation of the potential for road safety impacts through the calculation of collision rates (slight, serious and fatal). Collision clusters are identified by a detailed review of the baseline characteristics to determine the road safety sensitivity of discrete areas of the highway network.
Hazardous/ large loads	Some developments may involve the transportation of dangerous or hazardous loads by road.

12.6.6 The overall significance of a traffic-related effect will be determined based on the magnitude of change and the sensitivity of the receptor, guided by the matrix shown in Table 3-1.

12.7 Proposed Assessment Methodology

Baseline Assessment

12.7.1 For baseline data gathering and forecasting, it is proposed that a range of datasets are utilised to determine the environmental impacts associated with Proposed Development. These include, but are not limited to:

- Site visit and observations made regarding the access point from the public highway;
- Public Right of Way (PRoW) and National Cycle Network (NCN) information;
- Manual Classified Count (MCC) and ATC count surveys;
- Personal Injury Accident data; and
- Public transport services and accessibility considerations.

Consultation

12.7.2 Where necessary, the following stakeholders will be consulted:

- Local highway authorities – NLC and NELC
- Strategic highway authority – National Highways

Scope and Methodology

12.7.3 The methodology follows current best practice by assessing the impacts on the hierarchy of transport modes: pedestrians; cyclists; public transport users; and vehicle drivers and passengers.

12.7.4 The assessment will be based on data collected along Chase Hill Road and East Halton Road using an Automatic Traffic Counter (ATC), undertaken in 2023, and data in the public domain from recent planning applications that cover East Field Road, Rosper Road and the A160 to reach the strategic road network (A180).

12.7.5 Baseline traffic flows for the surrounding road network will be calculated to enable consideration of traffic growth to a construction year of 2026 and an opening year of 2028. These traffic flows will be used as a baseline to discuss the level of change resulting from the construction and operation of the proposed development.

12.7.6 A qualitative assessment of impact will be undertaken, based on the predicted rise in traffic flows against a measured baseline considering the temporary nature of the works.

12.7.7 The likely 'worst case' scenario will be described for the periods of peak traffic generation with the daily numbers of vehicle movements predicted. It is envisaged that the construction phase of the Proposed Development would last up to 36 months.

12.7.8 The assessment will identify the potential traffic and related environmental effects associated with these peak movements on sensitive receptors in terms of the assessment parameters referred to above. Mitigation measures to reduce the level of any anticipated significant negative impacts will be described, where necessary.

12.8 Assessment Limitations

12.8.1 The future baseline data is predicted on the basis of traffic growth forecasts derived from planning assumptions and trends of car ownership. The forecasts are applied based on area-wide assumptions and specific developments are likely to have a greater impact at a local level. While traffic flow assessments associated with such developments can be incorporated into the assessment, the study areas between the consented scheme and the Proposed Development may not overlap significantly and it may not be possible or reasonable to apply assumptions to complete any gaps identified.

12.9 Cumulative Effects

12.9.1 There are a number of planned developments that could potentially have a cumulative effect with the Proposed Development. An initial search within 3 km of the site has identified the following schemes:

- Able Monopile Manufacturing Facility PA/2021/1525 (NLC)
- VPI Immingham and Phillips 66 Post-Combustion Carbon Capture developments PA/2023/421 and PA/2023/422 (NLC)
- Site Enabling Works, Land East of Rosper Road, Killingholme PA/2023/502 (NLC)
- Port of Immingham Wind Turbines PA/2024/397 (NLC)
- Humber Tech Park Data Centre PA/2024/584 (NLC)
- Able Marine Energy Park (Development Consent Order (DCO)
- North Killingholme Power Project (DCO)

- VPI Immingham OCGT (DCO)
- Viking CCS Pipeline Project (DCO)

12.9.2 This study area is adequate to cover the road network likely to be used by these sites and the Proposed Development up to the A160, which itself is a high capacity road that serves the Port of Immingham. Where traffic flow information is available for these developments, data will be extracted to identify overlap with the study area for the Proposed Development and a cumulative assessment undertaken.

12.9.3 The in-combination effects associated with Traffic and Movement and Human Health arising from emissions from transport will be covered within Section 6 covering Air Quality.

13 CULTURAL HERITAGE

13.1 Introduction

13.1.1 This section has been completed by Allen Archaeology and will scope the assessment of the impact the construction and operation of the Proposed Development will have on the below ground archaeology as well as any above ground heritage assets. The focus will be on the construction phase as this presents the highest potential for disturbing archaeological remains due to intrusive groundworks for the proposed scheme.

13.2 Legislation and Policy

National Planning Policy

13.2.1 The relevant chapter of the NPPF [4] concerning archaeological and cultural heritage assets, is 'Section 16. Conserving and enhancing the historic environment' (Paragraphs 195 – 214). Paragraph 200 has special relevance concerning the responsibilities of planning applicant:

"In determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including contribution made by their setting. The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance. As a minimum the relevant historic environment record should have been consulted and the heritage assets assessed using appropriate expertise where necessary. Where a site on which development is proposed includes or has the potential to include heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation".

Local Planning Policy

13.2.2 The relevant policy of the Core Strategy 2011 [19] concerning archaeological and cultural heritage assets is CS6.

13.2.3 Policy CS6: Historic Environment

"The council will promote the effective management of North Lincolnshire's historic assets through:

- Safeguarding the nationally significant medieval landscapes of the Isle of Axholme (notably the open strip fields and turbaries) and supporting initiatives which seek to realise the potential of these areas as a tourist, educational and environmental resource;
- Preserving and enhancing the rich archaeological heritage of North Lincolnshire;
- ensuring that development within Epworth (including schemes needed to exploit the economic potential of the Wesleys or manage visitors) safeguards and, where possible, improves the setting of buildings associated with its Methodist heritage; and

- ensuring that development within North Lincolnshire's Market Towns safeguards their distinctive character and landscape setting, especially Barton upon Humber, Crowle and Epworth.

The council will seek to protect, conserve and enhance North Lincolnshire's historic environment, as well as the character and setting of areas of acknowledged importance including historic buildings, conservation areas, listed buildings (both statutory and locally listed), registered parks and gardens, scheduled ancient monuments and archaeological remains.

All new development must respect and enhance the local character and distinctiveness of the area in which it would be situated, particularly in areas with high heritage value.

Development proposals should provide archaeological assessments where appropriate."

13.3 Baseline Conditions

13.3.1 In order to complete this scoping exercise, the following data sources were consulted:

- Humber H2ub® (Green) Project sub-contractors Scoping Brief;
- reports on previous archaeological works that were located within the Site; and
- The North Lincolnshire Historic Environment Record (NLHER) – a database of archaeological sites and artefacts including data from the National Heritage List for England (NHLE). A search of this resource was undertaken for a study area extending 500m from the site boundary.

13.3.2 Each archaeological and historic site and Listed Building identified in the study area has been allocated a one or two digit 'site' number and assigned to a specific period according to the definitions outlined on the Historic England Periods List [77]. These sites are described in Table B1-1. All measurements referred to in this section are measured from the Site boundary to the edge of the polygon/line in question or to the site number if one of these is not present. Where applicable the sites are depicted on Map 13-1.

13.4 Previous Works

Geophysical Survey, Hornsea offshore wind farm (phase one), onshore cable route and substation – Pre-construct geophysics, 2011 [78]

13.4.1 The majority of the western pipeline route 1 and a small portion of western pipeline route 2 was the subject of geophysical survey as part of Phase one of Hornsea offshore wind farm. A square enclosure can be seen in the western pipeline route 1, this was later partially excavated (Site 25).

Report on Geophysical survey, Killingholme Power Stations, Humberside – Geophysical Surveys of Bradford, 1989 [79]

13.4.2 A 80m x 80m area within the Main Site was surveyed in 1989. It did not identify any features of interest.

Geophysical Survey Report, Able UK Ltd Marine Energy Park – GSB Prospection, 2011 [80]

13.4.3 This survey includes areas of the eastern pipeline route. A lot of the results show magnetic disturbance due to the close proximity to the road. However, some ploughing and linear features were also observed.

Geophysical Survey by Magnetometry On Land Off Chase Hill Road, North Killingholme – Allen Archaeology Ltd 2023 ([81])

13.4.4 This survey includes the northern section of western pipeline routes as well as the Main Site. The area within the pipeline route could not be surveyed and the area immediately northwest did not show any features aligned towards the site. The area of the Main Site that could be surveyed showed a lot of magnetic noise and a likely buried service.

Report on Geophysical survey, Killingholme power stations, Humberside – Geophysical Surveys of Bradford, 1990

13.4.5 This report is not held by the NLHER but the area surveyed is the same as the survey by Allen Archaeology in 2023. The survey did not identify any features of archaeological interest.

Geophysical Survey within a proposed road realignment at Clough Lane, North Killingholme – GeoQuest Associates, 2004 [82]

13.4.6 This survey included two small areas located within the eastern pipeline route. Nothing has been identified here by the NLHER.

Geophysical Survey Report 99/144 Southern Energy Corridor III – GSB Prospection, 1999 [83]

13.4.7 This marginally includes an area of the east pipeline route. Linear ditches and pits were observed that are recorded in the NLHER (Site 141). Due to a lack of further investigation the date of these is uncertain.

Geophysical Survey Report Humber Hydrogen Pipeline (South Bank) – GSB Prospection, 2006 [84]

13.4.8 Part of this survey fell within the eastern pipeline route and recorded evidence of modern farming practices such as drains and ploughing trends.

Report on Geophysical Survey Humber Link Pipeline – GSB Prospection, 1999 [85]

13.4.9 This survey is partly within the eastern pipeline route and found little of archaeological note.

Geophysical Survey of a Proposed Wind Turbine Test Site on Land East of Rosper Road – GeoQuest Associates, 2003 [86]

13.4.10 The survey was located partly within the eastern pipeline route. The survey was undertaken in an area of known Romano-British occupation. Two features of possible archaeological origin were recorded, although both features were given a low confidence rating and may be natural.

Geophysical Survey Report, North Killingholme 3 - Archaeological Project Services, 2007 [87]

13.4.11 The survey was located partly within the eastern pipeline route. The survey identified numerous weak responses, the origin of which were unclear.

Geophysical Survey at land adjacent to the Conoco Humber – GeoQuest Associates, 1999 [88]

13.4.12 The southeast corner of the surveyed area was marginally within the eastern pipeline route. A system of rectilinear ditches and a network of enclosures were exposed.

Geophysical Survey, A160-A180 Improvements - Archaeological Services WYAS, 2009 [89]

13.4.13 This survey only very marginally includes part of the eastern pipeline route. The area exposed a Late Iron Age to Early Roman enclosed settlement that has been subject to further investigation (Site 31).

Field walking

13.4.14 A very small area of the western pipeline route 2 was walked as well as parts of the eastern pipeline route and recorded no finds of note. A small area of the eastern pipeline route was walked in 2012 by Allen Archaeology. The prehistoric finds are listed as Site 11, and within the red line area include a single Neolithic to Bronze Age flint, an undated flint, a clay tobacco pipe fragment and post-medieval ceramic building material (CBM).

Watching Briefs

13.4.15 A watching brief was undertaken by Allen Archaeology in 2013 for an access route that was aligned roughly east-northeast to west-southwest through the eastern pipeline route. No archaeological features or deposits were identified.

LiDAR Survey

13.4.16 LiDAR topographical surveys have been carried out in the area by the EA. This has identified medieval ridge and furrow within the Site.

Archaeological Evaluation on Land at Eastfield Road, North Killingholme - Archaeological Project Services, 2006 [90]

13.4.17 A 15m long section of a 4.5m wide trench is located within the western pipeline route 2. Only post-medieval and modern features were observed.

Archaeological Trial Trenching Report Hornsea Offshore Wind Farm Project One – Wessex Archaeology, 2015 [91]

13.4.18 One and a half 30m long trenches from this project fall within the western pipeline route 1. No features were identified within the Site limits however a trench outside the red line 17m south and west of the west 1 route and 80m east of the western pipeline route 2 contained linear features that will likely continue into both these pipeline routes.

Trial Trenching on Land Off Chase Hill Road - Allen Archaeology, forthcoming

13.4.19 Seven trenches were excavated within the main compound. Modern services and land drains were present within four of these. No archaeological features or deposits were identified.

Further Excavation

13.4.20 Trial trenches (PCAS 2012 [92]) and an excavation (Wessex Archaeology 2017 [93]) within the western pipeline route 1 uncovered an Iron age square enclosure recorded in the NLHER (Site 25). The whole area was not fully excavated and the Iron Age enclosure definitely extends east into the area of the western pipeline route 1.

13.4.21 Trial trenches (AOC Archaeological Group 2023 [94]) and an excavation (Network Archaeology Ltd 2015) within the east pipeline route excavated part of a small late Iron Age enclosed settlement that saw activity into the early Roman period (Site 31). The whole settlement was not fully excavated, so further archaeology of this type is anticipated within the red line.

13.4.22 Trial trenching in 2013 by Allen Archaeology [95]covered part of the eastern pipeline route. One trench within the pipeline route was placed within the mapped extent of Site 27, identifying Iron Age and Roman features.

13.4.23 Trial trenching in 2012 by Allen Archaeology [96] covered Site 26, an Iron Age - Romano-British settlement. This area only slightly enters the eastern pipeline route and a trench in this location suggests the features do not continue into the pipeline route.

13.5 Designated Assets

13.5.1 There are no designated assets within the Site.

13.5.2 There are three Scheduled Monuments within 500m of the site, they are, Site 52: Moated site and associated earthworks at Baysgarth Farm, Site 53: Medieval moated site, Manor Farm and Site 54: Medieval moated site, `North Garth'. The sites are located in a line c.230m west of the site, a

fourth is also present 1.65km to the north, falling outside of the study area (Manor Farm moated site).

13.5.3 These monuments represent significant medieval activity in the area, relating to the medieval feudal system and manorial land holdings.

13.5.4 Four Listed Buildings are also present within the study area, all located to the west of the site over 340m away.

13.5.5 All of the designated assets within the study area are detailed below in Table 13-1.

Table 13-1 Designated Assets within 500m of the proposed development site

Historic England Ref	Name	Designation
1007813	Moated site & associated earthworks at Baysgarth Farm.	Scheduled Monument
1008044	Medieval moated site, Manor Farm.	Scheduled Monument
1007815	Medieval moated site, `North Garth'.	Scheduled Monument
1103729	Church of Saint Peter	Grade I Listed Building
1103701	Church of Saint Denys	Grade I Listed Building
1346854	Manor Farmhouse	Grade II* Listed Building
1214980	Stables/granary approx. 50m east of Manor Farmhouse.	Grade II Listed Building

13.5.6 There are no Conservation Areas, Registered Parks and Gardens, World Heritage Sites or Registered Battlefields within the study area.

13.6 Undesignated Assets

13.6.1 Seventeen undesignated assets are located fully or partly within the Eastern Pipeline Route, listed in order from north to south:

- Site 91 - Historically important hedgerow. Medieval.
- Site 141 – Linear ditches and pits, detected by geophysical survey in 1999. Uncertain date.
- Site 99 – General location of a barrage balloon anchorage, operated by 942 Squadron Balloon Command during WW II. Exact site unknown.
- Site 6 – Single prehistoric flint flake found east of Rosper Road in 1999.
- Site 119 – Site of a Second World War bomb crater.

- Site 11 – Seven pieces of Neolithic-Bronze Age worked flint were collected in two adjoining fields during fieldwalking.
- Site 26 – Iron Age - Romano-British settlement was excavated in 2015. Six inhumations were recorded on the site.
- Site 57 – A hedgerow which forms the parish boundary between North and South Killingholme, east of the refinery, is shown on enclosure maps, and may be medieval in origin.
- Site 86 – Site of unnamed unlisted outfarm. Demolished C19.
- Site 92 – Historically important hedgerow. Post-medieval.
- Site 42 - Later Roman ditches, possible continuation of a small farmstead or settlement recorded on the west side of Rosper Road.
- Site 142 – Deposits interpreted as the buried shoreline were recorded during archaeological evaluations in 2004 and 2005. Uncertain date.
- Site 27 – An Iron Age and Romano-British settlement was excavated on the site on the Conoco CHP plant between 2000 and 2002.
- Site 97 – Site of a house called Myrtle Villas shown on the 1945 OS map.
- Site 96 – Site of a mission room shown on the 1945 OS map.
- Site 19 – Two post holes were identified in a trial trench in 2023 with the remains of timber posts, one of which was radiocarbon dated to the Middle Bronze Age.
- Site 31 – Archaeological works uncovered a small Late Iron Age enclosed settlement that saw activity into the Early Roman period.

13.6.2 Five undesignated assets are located fully or partly within the Western Pipeline Route 1, listed in order from north to south:

- Site 25 – An Iron Age square enclosure was found during archaeological works, evidence of metal working was found on the site.
- Site 87 - Site of unnamed outfarm. Demolished C19.
- Site 60 – Medieval ridge and furrow.
- Site 105 - Site No 4, a former WWII RAF dispersed site west of Eastfield Road.
- Site 106 - Site No 5, a former WWII RAF dispersed site west of Eastfield Road.

13.6.3 Three undesignated assets are located fully or partly within the Western Pipeline Route 2, listed in order from north to south:

- Site 60 – Medieval ridge and furrow. Medieval dated
- Site 22 - Mid-late Iron Age were revealed during archaeological works. Prehistoric dated.
- Site 106 - Site No 5, a former WWII RAF dispersed site west of Eastfield Road. Modern dated.

13.6.4 Two undesignated assets are located fully or partly within the Main Site:

- Site 110 - Site of WWII heavy anti-aircraft battery.
- Site 133 - Rectangular feature (former cropmark), north of Chase Hill Road. Uncertain date.

13.6.5 There are 137 undesignated assets within the study area including those mentioned above. These are discussed below by period.

Prehistoric

13.6.6 Thirty-one Historic Environment Record (HER) assets date to the prehistoric period (Sites 1-31). A total of ten possibly date to the Mesolithic period, all of which are findspots or scatters of worked flint (Sites 1 - 10). Site 6 is partly located within the eastern pipeline route, this was the location of a single flint flake, the area has since been developed.

13.6.7 Five sites date from the Neolithic period onwards (Sites 11 – 15). Four of these are findspots/scatters of worked flint (Site 11 – 14). Seven pieces of worked flint dating from the Neolithic to the Bronze Age were collected in two adjoining fields during fieldwalking. One of these fields in within the eastern pipeline route. Site 15 is a former watercourse identified by a transect of auger samples.

13.6.8 Four sites date from the Bronze Age onwards (Sites 16 – 19). These consist of burnt stone and charcoal (Site 16), a findspot of a scraper (Site 17) and two sites in which Bronze Age features were uncovered (Sites 18 and 19). Site 19 is within the eastern pipeline route, two post holes containing timber post remains were identified in this area in 2023.

13.6.9 Twelve sites date to the Iron Age (Sites 20 – 31) with six also containing evidence from the Roman period (Sites 26 – 31). All are sites in which Iron Age features were identified during archaeological investigation. Sites 26, 27 and 31 are partly located within the eastern pipeline route, Site 26 is only very marginally within the red line area, with the majority of the site located to its east. All of the sites are Iron Age settlements that continued into the Roman period. Site 26 contained six inhumations.

13.6.10 The majority of Site 25 is located within the western pipeline route 1, this is the location of a square Iron Age enclosure with evidence of metal working. Half of Site 22 is located within the western pipeline route 2, Iron Age ditches and finds were excavated on the site in 2012.

Roman

13.6.11 Fifteen HER assets date to the Roman period (Sites 32-48). Seven are findspots of pottery (Sites 32- 38). Site 32 is a double-ditched penannular enclosure that is suspected to be prehistoric in date but during an evaluation only Roman pottery was found and a ring-ditch was not described.

13.6.12 The remaining sites represent Areas of Roman activity identified by excavation (Sites 39 – 48). The western extent of Site 42 is very slightly extends into the eastern pipeline route, ditches were uncovered here and this site is thought to be the continuation of a small farmstead or settlement recorded on the west side of Rosper Road.

Early Medieval

13.6.13 One HER asset dated to the early medieval period is within the study area. Anglo Saxon and medieval pottery were uncovered in 1999 c.380m west of the western pipeline route 2.

Medieval

13.6.14 Twenty HER assets date to the medieval period (Sites 50-69). These comprise the possible sites of the deserted medieval villages of Lobingham (Site 50) and Holtham (Site 51), four moated sites (Sites 52-55), reused stonework from Thornton Abbey (Site 56), a parish boundary hedgerow (Site 57), a sea bank (Site 58), areas of ridge and furrow (Sites 59 – 65), two churches (Sites 66 and 67), a medieval ditch (Site 68) and earthworks of a settlement that continued into the post-medieval period (Site 69). Ridge and furrow is present within all of the pipeline routes. A historic hedgerow is aligned east to west across the eastern pipeline route.

Post-medieval

13.6.15 Twenty-three HER assets date to the post-medieval period (Sites 70 – 92). The majority of these are farmsteads or farm buildings (Site 70 – 87). The remainder comprise the site of a smithy (Site 88), a cropmark of a boundary (Site 89), and historically important hedgerows (Sites 90 – 92). Five separate stretches of historically important hedgerows are located within the eastern pipeline route, as is Site 81, which is the site of an unnamed farmstead, demolished in the 19th century. Site 87 is another unnamed outfarm in the western pipeline route 1, this was also demolished in the 19th century.

Modern

13.6.16 Thirty-four HER assets date to the modern period (Sites 93 – 126). The Humber Commercial Railway was constructed in 1912 and is aligned roughly east to west through the southern extent of the study area, it crosses the western pipeline route 2 and is located directly south of the two other routes (Site 93). The site of a mission room (Site 96) and the site of a house named Myrtle Villas (Site 97) are within the east pipeline route. A row of terraced housed (Site 94) and two further buildings (Sites 95 and 98) are the only other modern sites not related to either of the World Wars (Site 42-51). A bomb crater is present within the eastern pipeline route (Site 119). The general location of a barrage balloon anchorage is also thought to be within the eastern pipeline route but its exact location is unknown (Site 99).

13.6.17 A World War II heavy anti-aircraft battery was recorded within the Main Site (Site 110) but is no longer present.

13.6.18 Two former World War II RAF dispersed sites are present within the western pipeline route 1, one of which slightly extends into western pipeline route 2 (Sites 105 and 106).

Uncertain

13.6.19 Eighteen HER assets are recorded as being of an uncertain date (Sites 127 – 144). These are sites that can't be accurately dated due to a lack of investigation or a lack of datable finds. Located within the eastern pipeline route are deposits interpreted as the buried shoreline, these were recorded during archaeological evaluations in 2004 and 2005 (Site 142). A rectangular cropmark was identified within the Main Site but is no longer present (Site 133).

13.7 Potential Effects

Construction Phase

13.7.1 The construction phase of the proposed development is likely to include (but is not limited to) groundworks for building foundations (piles and/or foundation trenches/pads), levelling and landscaping, drainage, services, access roads and construction compounds.

13.7.2 Previous archaeological investigations within the site compound have found nothing of archaeological interest, this area is therefore considered to have negligible archaeological potential.

13.7.3 All three pipeline routes contain archaeological sites, generally of an Iron age to Roman date. With this being said, the northern extent of the eastern pipeline route has already been developed as the area is now mainly covered in concrete. The area of the barrage ballon anchorage (Site 99) is now within a car park so it is very likely no longer present. The areas of note for this pipeline are Sites 27 and 31 both of which have already been partially excavated. Further investigation will likely be necessary if this route is chosen.

13.7.4 The main area of interest for the Western pipeline route 1 is Site 25. Again, this has been partially excavated but more investigation may be needed if this route is chosen.

13.7.5 The area of interest for the Western pipeline route 2 is Site 22. This is the location of an Iron Age Enclosure. A small area of excavation was completed within this site, 20m east of the pipeline route. The results indicate that the western extent of the enclosure would be within the pipeline route, and would require further investigation if this route was chosen.

13.7.6 However, beyond areas previously developed or subject to archaeological investigation, the archaeological potential of the Proposed Development area requires further assessment in order to more accurately define the likely impacts of the proposed development and to establish strategies to mitigate the likely effects. The proposals are set out in 13.9 below.

Operational Phase

13.7.7 The operational phase will cause no further adverse effects on below ground archaeology or on the designated assets within the study area.

13.8 Determination of Significance

13.8.1 The NPPF para 194 states “In determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting”. Significance is one of the guiding principles running through the historic environment section of the NPPF. The NPPF defines significance as “the value of a heritage asset to this and future generations because of its heritage interest. Such interest may be archaeological, architectural, artistic or historic” and it may derive “not only from a heritage asset’s physical presence, but also from its setting” [4]

13.8.2 The assessment of significance and impacts will be undertaken in accordance with 'Conservation Principles' [97], the Historic England Good Practice Advice 3 'Setting of Heritage Assets' [98]and Historic England Advice Note 12 'Statements of Heritage Significance' [99]The assessment methodology and criteria for understanding the significance of heritage values is described below, taken from Statements of Heritage Significance [99]

Archaeological interest

13.8.3 There will be archaeological interest in a heritage asset if it holds, or potentially holds, evidence of past human activity worthy of expert investigation at some point.

Architectural and artistic interest

13.8.4 These are interests in the design and general aesthetics of a place. They can arise from conscious design or fortuitously from the way the heritage asset has evolved. More specifically, architectural interest is an interest in the art or science of the design, construction, craftsmanship and decoration of buildings and structures of all types. Artistic interest is an interest in other human creative skills, such as sculpture.

Historic Interest

13.8.5 An interest in past lives and events (including pre-historic). Heritage assets can illustrate or be associated with them. Heritage assets with historic interest not only provide a material record of our nation's history but can also provide meaning for communities derived from their collective experience of a place and can symbolise wider values such as faith and cultural identity.

Significance

13.8.6 Table 13-2 sets out the receptor sensitivity of archaeological and heritage features. This will be used along with Table 13-3 which sets out the different levels of magnitude to assess the receptor sensitivity for each time period using Table 13-4.

Table 13-2 Receptor Sensitivity

Receptor Sensitivity	Examples
High	A legally protected site, including: Listed Buildings (I, II* and II); Scheduled Monuments; World Heritage Sites. Internationally and nationally significant sites that are not currently legally protected Grade I and II* Registered Parks and Gardens; Registered Battlefields;

	Major Settlements (e.g. Villas, Deserted Medieval Villages); Burial Grounds; Standing Historic Buildings (non-listed).
Moderate	Regionally significant site Grade II Registered Parks and Gardens; Some settlements; Find Scatters and find spots; Roman Roads; Sites of significant historic buildings.
Low	Locally significant site Field systems; Ridge and furrow earthworks; Trackways; Wells; Non-archaeological sites held by data source e.g. natural mound or palaeochannel.
Negligible	Site of limited significance Finds or features of a type common or abundant in the local area; Locally important features significantly damaged or altered.

Table 13-3 Magnitude of Impact

Magnitude	Examples
High	Total or near total destruction of the remains or sufficient change to result in a fundamental and irreparable reduction in the ability to understand the archaeological resource, its context and setting.
Moderate	Substantial destruction of the remains resulting in an appreciable reduction in the ability to understand the archaeological resource, its context and setting.
Low	Small-scale destruction of the remains resulting in a slight reduction in the ability to understand the archaeological resource, its context and setting.
Negligible	Very little or no substantive change to the remains with marginal reduction in the ability to understand the archaeological resource, its context and setting.

Table 13-4 Significance of Impact

		Magnitude of Impact			
		High	Moderate	Low	Negligible
Sensitivity of Receptor	High	High	High	Moderate	Negligible
	Moderate	High	Moderate	Low	Negligible
	Low	Moderate	Low	Negligible	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

13.9 Proposed Assessment Methodology

Baseline Assessment

13.9.1 The EIA will consult sources as listed below:

- Lincolnshire Archives – holds a range of historic maps, for example enclosure maps, Tithe maps, estate plans, and former editions of Ordnance Survey maps of the development area;
- Allen Archaeology's own reference library – secondary sources pertaining to the archaeology and history of the region;
- Environment Agency Lidar Data - Downloaded from the Defra Survey Data Download website [100]
- A site visit has been carried out in order to assess the present situation of the Site, to identify any areas where the potential archaeological resource may be particularly well preserved or damaged by recent development, and to observe the site in its landscape context;
- listing data from the NHLE;
- reports on previous archaeological works that were located within the Site; and
- NLHER – a database of archaeological sites and artefacts, listed buildings and Scheduled Monuments.

Guidance

13.9.2 The EIA will be informed by the following list of guidance.

- Standard Archaeological Field Evaluation (2023) [101]
- Universal Guidance for Archaeological Field Evaluation (2023) [102]
- Standard and guidance for the collection, documentation, conservation and research of archaeological materials (2020) [103]
- Standard and Guidance for Historic Environment Desk-Based Assessment (2020) [104]
- Standard and guidance for archaeological geophysical survey (2020) [105]

- Geophysical Survey in Archaeological Field Evaluation (2008)
- EAC Guidelines for the use of geophysics in Archaeology, Questions to Ask and Points to Consider. EAC Guidelines 2 (2016) [106]
- The Use of Geophysical Techniques in Archaeological Evaluations. IFA Paper No. 6. The Institute for Archaeologists (2002) [107]
- Statement of Heritage Significance: Analysing Significance in Heritage Assets Historic England Advice Note 12 (2019) [99]
- Historic England. The setting of heritage assets, historic environment good practice advice in planning, Note 3 (Second Edition) (2017) [98]
- Historic Environment Good Practice Advice in Planning (2015) [108]
- Management of Research Projects in the Historic Environment: The MoRPHE Project Managers' Guide (2015) [109]
- Conservation Principles, Policies and Guidance (2008) [97]

Consultation

13.9.3 The scope of all non-intrusive and intrusive surveys will be agreed in advance with the Historic Environment Officer for NLC. Written Schemes of Investigation will be prepared and agreed in advance of works commencing for each stage of work.

Scope and Methodology

13.9.4 In order to provide further site-specific information concerning the nature and extent of the potential archaeological resource and to more accurately assess the impact of the Proposed Development, further non-intrusive and intrusive surveys are recommended for the chosen pipeline route, where the route has not previously been investigated.

13.9.5 In the first instance, this will likely comprise a geophysical survey by magnetometry of all areas suitable for this technique, that have not been previously investigated. Previous geophysical surveys of the site have been partial, poorly located, and/or undertaken several decades ago, and geophysical survey equipment and techniques have improved considerably since then. This will be combined by an assessment of LiDAR imagery of the Site.

13.9.6 Following completion of the geophysical survey and LiDAR survey, a programme of intrusive trial trenching is recommended, to investigate anomalies identified by the geophysical survey and to confirm their depth, extent of survival, date, condition and significance, where such works have not been previously undertaken. Apparently blank areas of the geophysical survey will also be targeted to confirm the results of the survey.

13.9.7 Further mitigation may be necessary along the chosen pipeline route, subject to the result of the non-intrusive and intrusive surveys.

14 ECOLOGY

14.1 Introduction

14.1.1 This chapter of the ES will present an assessment of the likely significant effects of the Proposed Development on Ecology. Mitigation measures will be identified, where appropriate, to avoid, reduce or offset any significant adverse effects identified and/or enhance likely beneficial effects. The significance of the likely residual effects will be reported.

14.2 Legislation and Policy

14.2.1 The following legislation is relevant to the Proposed Development:

- Environment Act 2021
- The Conservation of Habitats and Species Regulations, 2017;
- Wildlife and Countryside Act, 1981 (as amended);
- The Natural Environment and Rural Communities Act, 2006;
- The Countryside and Rights of Way Act, 2000;
- Town and Country Planning (Environmental Impact Assessment) Regulations, 2017;
- The Hedgerows Regulations, 1997;
- The Protection of Badgers Act, 1992; and
- The Wild Mammals (Protection) Act, 1996.

14.2.2 The following national and local planning policy is relevant to the Proposed Development:

National

- National Planning Policy Framework 2023 [4]; and
- National Planning Practice Guidance – Biodiversity Net Gain [110]

Local

- The North Lincolnshire Local Development Framework (updating and replacing the North Lincolnshire Local Plan Adopted May 2003).

14.3 Baseline Conditions

14.3.1 The ES will consider the Main Site as well as the pipeline route(s) required for the Proposed Development.

14.3.2 The Main Site is bounded to the north by Hornsea Offshore Windfarm Onshore Substation, south by Lindsey Oil Refinery, east by woodland and west by an unnamed road. Within a wider context,

the site is surrounded by existing residential and industrial development, open agricultural land and the Humber Estuary. The pipeline route(s) run through this wider area within industrial and agricultural land.

14.3.3 The site and its wider area comprises farmed grassland and bare ground, areas of plantation woodland and scattered and dense scrub, as well as industrial infrastructure comprising roads, buildings and hardstanding. Hedgerows and tree lines are present separating fields.

14.3.4 No statutory ecological designations would be directly affected by works at the site or its pipeline route(s). All statutory ecological designations in the surrounding area are well separated from the site by existing infrastructure and industrial development.

14.3.5 Chase Hill Wood LWS is located within the Proposed Development boundary at its eastern edge. This is an area of woodland dominated by semi-mature Ash, which supports a range of common woodland birds. This site would be retained and protected within the proposals.

14.3.6 Other non-statutory sites of similar ecological composition are present in the wider area in proximity to the pipeline route(s). None of these are anticipated to be affected by the proposals.

14.3.7 The Proposed Development and its wider area do not contain any areas of ancient woodland or notable or veteran trees.

14.4 Receptors

14.4.1 The following receptors are present which may be subject to effects of the Proposed Development and which will require more detailed consideration in the ES:

- Humber Estuary SPA;
- Great Crested Newt – confirmed to be present in water bodies within the site and wider area;
- Bats – known to forage within the wider area of the site;
- Breeding Birds – common species using suitable habitats for nesting;
- Badger – present within the site.

14.5 Potential Effects

14.5.1 Likely potential effects of the Proposed Development are listed below.

Construction

- Permanent potential effects arising from loss and fragmentation of habitats within and around the Proposed Development, and temporary effects arising during construction activities.
- Potential effects on the Humber SPA arising from loss or disturbance of functionally linked habitats used by qualifying resources of the SPA;
- Loss of habitats of some ecological value, such as woodland and hedgerows that are likely to qualify as Priority Habitat;

- Loss of habitats supporting species such as nesting birds;
- Loss of terrestrial habitats that may be used by Great Crested Newt;
- Loss of foraging habitat used by Badger and/or effects on Badger setts;
- Severance or fragmentation of wildlife corridors that may be used by species including bats and Badger;
- Temporary disturbance arising from construction activities that cause noise, dust, water or air pollution, or disturbance from lighting.

Operation

- Disturbance arising from operational noise and lighting;
- Potential beneficial effects of new landscaping measures and biodiversity enhancements.

14.6 Determination of Significance

14.6.1 The evaluation of ecological features and resources should be based on sound professional judgement whilst also drawing on the latest available industry guidance and research. The approach set out below is based on that described in 'Guidelines for Ecological Impact Assessment in the UK and Ireland' published by the Chartered Institute of Ecology and Environmental Management (CIEEM) updated in 2022 [111] whereby important ecological features are identified, and these are considered within a defined geographical context using the following frame of reference:

- International;
- National;
- Regional;
- County;
- District;
- Local;
- Site (not of elevated importance at a local level).

14.6.2 Features considered to be of importance at the site level only will be scoped out of this assessment.

Receptor Sensitivity

14.6.3 Each receptor has been assigned a level of sensitivity to change, based on the level of value set out above together with consideration of any particular sensitivities to damage or disturbance, broadly assessed as follows:

- Very High - International, e.g. European designations;
- High - National, Regional e.g. a SSSI or National Nature Reserve (NNR), or an important bat population;

- Medium - Regional, County, District e.g. a County Wildlife Site (CWS), a notable farmland bird assemblage;
- Low - Local e.g. common and widespread species and habitats;
- Negligible - At the site level only e.g. areas with very low ecological value.

14.6.4 The CIEEM publication 'Guidelines for Ecological Impact Assessment in the UK and Ireland' [111] also sets out a methodology for the assessment of potential effects arising from development. These methods are followed which can be summarised as below.

14.6.5 Likely effects are determined with reference to aspects of the ecological structure and function on which the feature or resource depends. This includes factors such as the available resources, ecological processes, human influences, historical context, ecological relationships, ecological role or function and ecosystem properties. Based on this context, the nature of the effect is characterised and considered under the following parameters:

- Positive or negative – a descriptor of an adverse or beneficial effect. An effect may also be neutral;
- Extent – the size or magnitude of an effect, the area of habitat or number of individuals affected;
- Duration – the time for which the effect is expected to last prior to recovery or replacement, i.e. short-term or long-term;
- Reversibility – the potential for an affected receptor to return to its original state. An effect may be irreversible in that recovery is not possible within a reasonable timescale or there is no reasonable chance of action being taken to reverse it, i.e. permanent or temporary;
- Timing and frequency – how often an effect may occur. For example, some changes may only cause an effect if they coincide with critical life-stages or seasons, whilst frequent events may cause a greater effect than a single event.

14.6.6 Based on these parameters, the scale of effect (or magnitude) can be summarised. This includes both adverse and beneficial effects.

- Substantial Adverse - A permanent or long-term adverse effect on the receptor, which may result in severe damage to key characteristics and implications for the integrity of the receptor or its conservation status.
- Moderate Adverse - Impacts resulting in partial loss of or damage to a receptor, which could have implications for the integrity of the receptor or its conservation status.
- Slight Adverse - Short-term or temporary effects resulting in only minor loss of or damage to a receptor, unlikely to have implications for the integrity of the receptor or its conservation status.
- Negligible - No effect or only a short-term reversible effect with no long-term effect on the receptor.
- Slight Beneficial - Impacts that would result in minor benefits to a receptor, such as small increases in provision of resources or minor reduction in adverse effects or pressures on the receptor by baseline conditions.
- Moderate Beneficial - Impacts that would result in beneficial effects on a receptor of sufficient magnitude or scale to improve their integrity or conservation status.
- Substantial Beneficial - Permanent or long-term beneficial effects on a receptor which are likely to result in substantial improvements to the integrity or conservation status of the receptor.

14.6.7 Based on the nature of the effect, an assessment is then made whether the effect on a habitat or species is likely to be ecologically 'significant'. CIEEM guidance [111] defines a 'significant effect' as "an effect that either support or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general", going onto state that "significant effects encompass impacts on structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution)."

14.6.8 Significance is also assessed at an appropriate geographic scale. For example, a significant effect on a SSSI would be of national significance.

14.6.9 For some ecological features (notably designations), there may be an existing statement of the conservation status of a feature and objectives and targets against which the effect can be judged. For example, SSSIs are assessed under six condition categories, namely favourable, unfavourable recovering, unfavourable no change, unfavourable declining, part destroyed, and destroyed. An effect that exerts a change between these condition categories would be considered as significant.

14.6.10 Where no existing statement of conservation status is available, an assessment is made against the existing status and condition of the habitat or species population, as recorded by survey data and background information, taking into account the level of ecological resilience or existing conditions that a habitat or species is currently subject to. An effect resulting in a long-term change to the existing background population trend or status at a given geographical level would be considered as significant. In this regard, a significant beneficial effect could be defined as one that prevents or slows an existing decline in the favourable conservation status of a habitat or population as much as one that permitted a population or habitat area to increase.

14.6.11 The likelihood or uncertainty of an effect occurring as predicted is also considered. To assist with defining certainty, the following scale will be used (with broad confidence levels indicated in percentage terms):

- Certain/near-certain: probability estimated at 95% chance or higher;
- Probable: probability estimated above 50% but below 95%;
- Uncertain: probability estimated above 5% but less than 50%;
- Extremely unlikely: probability estimated at less than 5%.

14.6.12 The temporal scope used in the assessment for effects during construction and operation will be:

- Short-term: 0-2 years
- Medium-term: 2-4 years
- Long-term: 4+ years

14.7 Mitigation

14.7.1 Mitigation is provided in order to minimise the risk of occurrence and magnitude of potential advise effects of the proposals. In accordance with IEMA guidance, mitigation is categorised as 'primary' (inherent design), 'secondary' (foreseeable) or 'tertiary' (inexorable) mitigation. With regards ecology, these categories correspond to the following:

14.7.2 Primary mitigation: measures incorporated within the design of the Proposed Development that serve to avoid or prevent potential adverse effects, including retention and protection of important habitats and features, such as existing habitats of value, trees with the potential to support roosting bats, continuity of function of wildlife corridors, and new planting that provides a protective buffer to retained habitats.

14.7.3 Secondary mitigation: measures incorporated to ensure that potential long-term or off-site adverse effects on ecological resources are minimised. These will include any in-combination effects of the proposals.

14.7.4 Tertiary mitigation: measures that are required in respect of unavoidable adverse effects of the Proposed Development. In this case, this comprises measures to protect reptiles that are present at the Site during construction works.

14.7.5 Examples of likely mitigation measures are set out below.

Construction

14.7.6 Measures will be undertaken during the construction phase in order to minimise disruption and manage the effects of the Proposed Development.

Habitats and Ecological Features

14.7.7 To minimise the potential for adverse effects occurring within retained habitats during the construction phase (for example, as a result of dust deposition, damage to vegetation, soil compaction, or degradation of water bodies), measures will be implemented in accordance with a. Measures relevant to ecology include:

- Erection of protective fencing around retained trees and hedgerows (including off-site hedgerows) in accordance with BS5837:2012;
- Storage of materials and vehicles away from receiving waters;
- Dampening down of potential sources of dust;
- Adherence to Environment Agency Pollution Prevention Guidelines; and
- Implementation of noise suppression measures where required, such as turning off plant when not in use, and not siting generators close to sensitive ecological features.

14.7.8 The Environment Agency Pollution Prevention Guidelines were withdrawn in December 2015 and were replaced with ‘Guidance for Pollution Prevention’ guidance series, which contains regulatory requirements and good practice advice. However, the guidance within the Pollution Prevention Guidelines still remains relevant to the construction phase of the Proposed Development and has therefore been included in the interest of good practice.

Bats

14.7.9 Trees supporting features suitable for use by roosting bats will be retained and protected during construction. Protective fencing will be erected around these trees to encompass the entirety of their Root Protection Zones (RPZs) and within which no construction works will take place.

14.7.10 Should any bats be present within potential roost features at these trees, measures protecting RPZs is considered sufficient to prevent adverse effects.

14.7.11 To minimise the potential for effects of construction lighting, temporary lighting will be minimised and avoided in proximity to trees and woodland. Where this is unavoidable, lighting will be positioned so as to minimise light spill on to features of ecological importance. Disturbance from noise will be minimised by the adoption of good working practice methods.

Badger

14.7.12 Badger is a highly mobile species which readily moves and re-uses setts. Although the most recent surveys have not found evidence of the presence of this species, it is possible that new setts may be created at any time. As a precaution, an updated badger survey will be undertaken prior to the commencement of construction works to confirm that no setts are present or, if new setts are found, to inform the detail of any mitigation or licensing that may be required.

14.7.13 If any new setts are found during the updated survey and these cannot be retained, they will be closed (temporarily where possible) under licence from Natural England. The appropriate processes and mitigation measures will be included in any licence application, in order to safely close and destroy the sett while maintaining the current status of the local badger population.

14.7.14 Measures will be included to safeguard any Badgers that may be incidentally present within the Site during construction works, as follows:

- Contractors will be briefed as to the possible presence of badgers within the Site, with particular reference to the implications of legislation and licensing;
- Any trenches or deep pits within the Site that are left open overnight will be provided with a means of escape should a badger enter. This could simply take the form of a roughened plank of wood within the trench that provides a ramp leading to the surface. This is particularly important if the trench is at risk of filling with water;
- All trenches and pits will be inspected each morning to ensure no animals have become trapped overnight;
- The storage of topsoil or other ‘soft’ building materials in the Site will be given careful consideration as Badgers will readily adopt such mounds as setts. Such mounds will be kept to a minimum and will be subject to inspections by site contractors. Where appropriate, consideration will be given to the use of temporary fencing of any such mounds to exclude Badgers;
- Chemicals stored at the site will be contained in such a way that they cannot be accessed or knocked over by wildlife;
- Fires, if permitted within the Site, will only be lit in secure compounds and will not be allowed to remain lit during the night;
- Food and litter will not be left within the working area overnight; and
- Disturbance from noise will be minimised by the adoption of good working practice, as outlined above

Breeding Birds

14.7.15 The potential loss of active nests (within trees and scrub) during construction will be mitigated by either undertaking clearance of potential bird nesting habitat outside the breeding season (March to August inclusive) or, if necessary, preceding any clearance by an inspection by a professional ecologist. Any nests found will be cordoned off and protected until they cease to be active. Disturbance from noise and lighting will be minimised by the adoption of good working practice.

Operation

14.7.16 The following mitigation measures will be adopted as part of the Proposed Development after completion of construction:

- Retention of key habitat areas with appropriate protection/buffer areas;
- Provision of connective habitat in the form of corridors of non-development land around the Site, providing strong linkages to existing off-site habitats;
- Provision of buffer habitats, by planting and provision of green spaces around the site boundaries;
- A full lighting strategy, which will be submitted to the local planning authority for agreement prior to the completion of the development. This will seek to minimise potential effects on wildlife whilst ensuring adequate lighting for operational purposes;
- Provision of new habitats such as flower-rich grassland and native trees to increase local habitat diversity; and
- A landscape strategy which includes new native tree species.
- The landscape strategy will take into account existing ecological and landscape constraints and opportunities.

14.8 Proposed Assessment Methodology

Baseline Assessment

14.8.1 The ecological baseline will be determined from a suite of ecological surveys, undertaken in accordance with appropriate survey guidance, which will be further informed by a desk study of biological records and designated sites.

Guidance

14.8.2 The following guidance is relevant to the proposals:

- Bat Mitigation Guidelines 2004 [112];
- Bat Surveys for Professional Ecologists – Good Practice Guidelines, 2023 [113];
- Occasional Publication No.9 – Surveying Badgers, 1989 [114];
- Natural England Standing Advice: Great Crested Newts;
- Great Crested Newt Mitigation Guidelines, 2001 [115];

- Analytical and Methodological Development for Improved Surveillance of Great Crested Newt 2014 [116];
- Herpetofauna Workers Manual (revised reprint) 2003 [117];
- Advice Sheet 10: Reptile Survey, 1999 [118];
- Bird Census Techniques, 2000 [119]; and
- Bird Survey Guidelines for assessing ecological impacts, v.1.1.1, 2023 [120].

Consultation

14.8.3 The following organisations will be contacted for information relevant to the proposals:

- Natural England;
- Environment Agency;
- Lincolnshire Environmental Records Centre.

14.9 Assessment Limitations and Assumptions

14.9.1 All of the species that occur in each habitat are not necessarily detectable during survey work carried out at any given time of the year, since different species are apparent during different seasons.

14.9.2 All faunal surveys will be undertaken at the appropriate times of year and during suitable weather conditions as set out within the appropriate survey guidance such that no significant constraints or limitations are likely to apply.

15 CLIMATE CHANGE

15.1 Introduction

15.1.1 The purpose of the Proposed Development is to generate green hydrogen on a large scale to displace the use of fossil fuel derived gaseous fuels and hence support decarbonisation of local industry. As such the Proposed Development is anticipated to make a significant positive impact to reducing industry CO_2 through the reduction of 100,000 tonnes of CO_2 per annum from the Humber Refinery, and is scoped into the EIA.

15.1.2 This section considers the climate change implications of the Proposed Development. The climate change assessment will consider three assessment aspects:

- Lifecycle greenhouse gas (GHG) impact assessment: This will assess the net impact on GHG emissions arising from the Proposed Development on the climate including how it will affect the UK meeting its national carbon budgets.
- Climate Change Resilience Assessment (CCRA): This will assess the resilience of the Proposed Development to climate change impacts
- In-combination Climate Impact (ICCI) Assessment: This will assess the combined impact of climate change and the Proposed Development on receptors in the receiving environment

15.2 Legislation and Policy

15.2.1 The relevant international and national legislation includes:

- United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement [121] - The legally binding treaty committing to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels.
- The Climate Change Act 2008 [122], The Climate Change Act 2008 (2050 Target Amendment) Order 2019 [123] and the Carbon Budget Order [124] establishing the UK carbon budgets and Net Zero Target for 2050

15.2.2 Relevant national policy includes:

- The Overarching NPS for Energy (EN-1) [5]
- The NPS for Natural Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) [125];
- Our Green Future: Our 25-year Plan to Improve the Environment (2018) [126]
- The Net Zero Strategy: Build Back Greener (2021) [127];

15.2.3 Impacts on climate change are required to be assessed under the Schedule 4, Part 5(f) of the EIA Regulations. The NLC Core Strategy Policy CS18: Sustainable Resource Use and Climate Change [19] will also be considered.

15.2.4 In accordance with the UK Low Carbon Hydrogen Standard [1] , the hydrogen produced from the Proposed Development will have a total carbon intensity of less than 20.0 gCO_2e/MJ H2 (lower heating value (LHV)).

15.2.5 The Proposed Development will be assessed in terms of its CO_2 releases against the Climate Change Act, and its subsequent amendments, and the contribution it will make to the UK's carbon budget in future periods.

15.3 Baseline Conditions

15.3.1 The Baseline Condition for the GHG assessment will be based on the current and projected future greenhouse gas emissions of the region if the Proposed Development was not constructed or operated. The construction and operation of the Proposed Development are implicit for the CCRA and ICCI as these will consider how resilient the Proposed Development and surrounding environment are to current and projected future climate change.

15.4 Receptors

15.4.1 For the GHG, the primary receptor is the global climate and the potential impacts on the achievement of UK carbon budgets. The receptor for the CCRA is the Proposed Development itself while the ICCI assessment receptors are those identified within the relevant individual chapters of the scoping report and may include residential and ecological receptors.

15.5 Potential Effects

15.5.1 The Proposed Development will entail the release of CO_2 and potentially other GHGs during the construction and operational phases from a GHG perspective.

15.5.2 The construction and operational phases have the potential to be impacted by climate related aspects, such as extreme weather and flooding.

15.5.3 Potential climate change impacts arising from the decommissioning phase will not be quantitatively considered during the climate change assessment due to the unknowns in the decommissioning phase but actions to minimise such impacts would be controlled under an appropriate Decommissioning Environmental Management Plan. Similarly the potential impacts of climate change on decommissioning activities are difficult to assess at this point, but again would be considered as part of the risk management process for decommissioning.

Impacts on the Climate from the Proposed Development

15.5.4 The potential effects to be considered from the construction phase include CO_2 and other GHG emissions from construction vehicles travelling to and from the Site and GHG emissions from machinery operated on the Site during the construction period, together with the GHG emissions embodied within the construction materials.

15.5.5 The potential effects to be considered from the operational phase include CO_2 and other GHG emissions from operational staff and contractors travelling to and from the Site, including deliveries of consumables and removal of wastes, GHG emissions from any auxiliary combustion plant present as part of the Proposed Development, GHG emissions embodied within any routine maintenance, repair and replacement activities and consumables, and GHG emission associated with any external power or heat consumption (noting the intention to secure renewable energy

through a PPA). As the primary purpose of the hydrogen produced is to support decarbonisation of local industry, the GHG emissions avoided due to the hydrogen produced by the Proposed Development will also be quantified and assessed.

15.5.6 The GHG Emissions assessment described will consider the embedded design mitigation. Relevant embedded mitigation measures will be described. Any residual significance of effects will be mitigated with further recommendations.

Impacts of Climate Change on the Proposed Development

15.5.7 The impacts of climate change on the development can be considered in the following categories:

- Impact on the performance of the plant
- Impact on the site location

15.5.8 The plant performance itself can be influenced by changes to the extremes of temperature, rainfall, winds or other ambient conditions that it experiences. This can change the performance (positively or negatively) of air or water based cooling systems, and for plant items such as water treatment plant. This particular aspect will be considered further during the EIA based on engineering judgment.

15.5.9 Beyond the performance of plant, change to climate conditions can impact negatively on the general environment experienced at the Proposed Development. This may include impacts relating to extreme weather events, flood risk, drought, wildfire and changes to temperature and precipitation.

15.5.10 As discussed in section 18.1, a FRA will be prepared as part of the planning application, which will include consideration of flood risk from all sources, including allowance for climate change. It is therefore proposed that impacts relating to flooding are scoped out of the Climate Change chapter.

16 MAJOR ACCIDENTS AND DISTASTERS

16.1 Introduction

16.1.1 The Major Accidents & Disasters (MA&D) chapter will provide an assessment of the reasonable worst-case impacts of relevant man-made and natural hazards. Major accidents are intrinsically accidents which could result in serious (i.e. significant) damage to the environment and human health. Therefore, the likelihood of a major accident will form the basis of the MA&D assessment.

16.1.2 The potential significant hazards which may impact or arise from the Proposed Development will be mitigated through the design and compliance with existing legislation.

16.2 Legislation and Policy

16.2.1 The assessment will be carried out in accordance with the IEMA MA&D Primer document [128]. Consideration will also be given to a number of applicable complementary / overlapping legislative regimes that will influence the design, construction, and operation of the Proposed Development such as:

- Health and Safety at Work Act, 1974;
- The Management of Health and Safety at Work Regulations 1999;
- The Workplace (Health, Safety and Welfare) Regulations 1992;
- The Construction (Design and Management) Regulations 2015 (CDM);
- Pressure System Safety Regulations 1996 (PSSR);
- The Pipeline Safety Regulations 1996 (PSR); and
- Control Of Major Accident Hazards Regulations 2015 (COMAH)

16.2.2 In the evaluation of appropriate risk mitigation, the Health and Safety Executive (HSE) defines and uses the principle of ‘As Low As Reasonably Practicable’ (ALARP)) [129]. The principle of ALARP is the principle that will be used within the MA&D assessment with respect to residual risk.

16.3 Baseline Conditions

16.3.1 An initial scoping exercise has been carried out for the Proposed Development site which included a review of:

- National Risk Register of Civil Emergencies, 2017 [130]
- The Humber Community Risk Register 2018 – 2021 [131]
- The COMAH Public Information Search [132]

16.3.2 The Site is located within a geographically and meteorologically stable part of Europe. As such, the local area should not be at significant risk from natural hazards (e.g. earthquakes or extreme weather conditions). The Main Site of the Proposed Development is located to the north of a heavily industrialised area with pipeline routes which may be in close proximity to industry,

therefore there may be existing developments in the area that could be potential sources of major accidents or sensitive receptors (i.e. COMAH establishments). A list of existing developments which are relevant to the baseline will be compiled from desk-based searches and consultation with the LPA and HSE. The baseline relevant to the MA&D assessment will comprise of:

- A description of natural hazards which may impact the Proposed Development;
- existing major accident hazard sources that may impact the Proposed Development;
- external factors which could contribute to a potential source of a hazard; and
- sensitive receptors within an appropriate study area, that are at risk of hazards arising for or exacerbated by the Proposed Development.

16.3.3 Receptors that are considered sensitive to major events, that will be identified within the MA&D assessment are:

- Human population such as members of the public and local communities
- The natural environment, both in general (air, water, and land) as well as specific areas of importance, such as habitats with statutory designations such as SSSI, SAC, SPA and Ramsar sites
- Property and material assets such as key infrastructure and utilities

16.4 Scope of Assessment

16.4.1 As MA&D are intrinsically hazards which could result in significant and substantial harm to human health and the environment, not all potential events impacting on or arising from the Proposed Development are within scope of the MA&D assessment. Following IEMA guidance [128], events will be scoped into the MA&D assessment based on their level of consequence and level of likelihood. High consequence/high likelihood events are considered unacceptable and will be designed out and low consequence events do not meet the definition of MA&D. Therefore only high consequence/low likelihood events will be in scope.

16.4.2 As part of the MA&D assessment further information on potential major events will be gathered from risk assessments conducted as part of the design process such as hazard identification (HAZID) assessments and the CDM risk register.

16.4.3 Major event types related to other environmental factors within the ES will be accounted for, including the appropriate mitigation to reduce the risk and impact of a major accident, within their respective chapters (e.g. major road accidents will be covered within the Traffic & Transport chapter) and not repeated within this chapter. An initial shortlist of major event types to be evaluated within the MA&D ES chapter has been proposed and is provided in Table 16-1.

Table 16-1 Proposed Scope of MA&D Assessment

Major Event Category	Major Event Type	Scoped in / out	Justification
Geophysical	Earthquake	Out	The Site is not located within a tectonically active area.

	Ground collapse	Out	Included within Ground Conditions chapter.
Meteorological	Severe weather (e.g., Flooding, Storms, Drought etc.)	Out	Included within Flood Risk Assessment and/or Climate Change chapter.
Industrial Accident	Release of an asphyxiant gas	In	Nitrogen will be used for purging pipework. Depending on the electrolysers housing, there is potential for accidental releases where site operators are present.
	Incident at a COMAH establishment (Domino effect)	In	Potential for such an event due to the number and proximity of COMAH establishments to the Proposed Development and the possibility that the Proposed Development may also be classed as a COMAH establishment.
	Explosion or fire	In	Potential for such an event due to presence of explosive and flammable substances.
Malicious Attack	Terrorism / Vandalism	Out	The Proposed Development will be designed and operated with security controls in order to reduce the potential of this event.
Infrastructure / Pollution Incident	Chemical or pollutant leaks into the air / land / water	Out	Included within Air Quality/Ground Conditions/Water Quality chapters.
	Utilities failure (gas, electricity, water, sewage, etc.)	In	Potential for such an event to affect the Proposed Development as well as for the development to affect existing infrastructure in the surrounding area.
Transport Accidents	Aircraft impact	Out	Operational structures will not be any taller than existing structures in the immediate vicinity. Construction structures will only be present temporarily and not expected to be taller smaller existing structures in the immediate vicinity.
	Major road accident	Out	Included within Traffic and Transport chapter.

16.5 Proposed Assessment Methodology

16.5.1 The MA&D assessment will identify the reasonably foreseeable worst-case scenario of a hazard or threat as identified by the methodology described herein. As MA&D are intrinsically hazards which could result in significant and substantial harm to human health and the environment, the assessment will focus on the likelihood of a major accident or disaster occurring. The principle of ALARP will also be used to identify if embedded mitigation measures are sufficient, or if further mitigation is required.

16.5.2 The significance of the potential major events identified will be determined through consideration of the following factors as described within IEMA guidance [128]:

- The geographic extent of the effects (effects beyond the development boundaries are more likely to be considered significant);
- the duration of the effects (effects which are permanent or long-lasting are more likely to be considered significant);
- the severity of the effects in terms of number, degree of harm to those affected and the response effort required (effects which trigger the mobilisation of substantial civil emergency response effort are more likely to be considered significant);
- the sensitivity of the identified receptors; and
- the effort required to restore the affected environment (effects requiring substantial clean-up or restoration efforts are more likely to be considered significant).

16.5.3 The MA&D assessment will consider the shortlisted major event types identified in Table 16-1 and will include:

- Identification of hazards/threats and their sources;
- identification of receptors linked to the listed hazards and the pathways from source to receptor;
- determination the reasonable worst-case scenarios of hazard at the relevant receptors;
- identification of the embedded mitigation measures already in place; and
- determination of whether the embedded mitigation ensures that the hazard risk is ALARP.

16.5.4 If the residual risk is not determined to be ALARP, then identification of secondary mitigation measures will be presented in the ES chapter.

16.6 Cumulative Effects

16.6.1 The MA&D assessment will assess the potential for cumulative effects from the list of planned developments provided in section 3.6. Other developments identified by relevant stakeholders, such as the Competent Authority (jointly the EA and HSE), will also be considered such as potential domino effects resulting from or impacting on the Proposed Development.

17 SOCIO-ECONOMICS

17.1 Introduction

17.1.1 This section sets out the socio-economic assessment that will be undertaken for the Proposed Development. Socio-economic effects relating to the employment structure within the local area will be considered. This will include regional employment needs and the likely impact on the local economy that may arise from constructing and operating the Proposed Development.

17.2 Legislation and Policy

17.2.1 The opportunity offered by the transition to net zero to provide job opportunities and upskilling of local workforces is identified in many of the national policies listed in section 4. In addition, the following local policies and programs are relevant:

- North Lincolnshire LDF Core Strategy CS13 [19]
- North Lincolnshire Economic Growth Plan [133]
- The upskilling of the local workforce, including increasing apprenticeship places, has been identified as a key priority of the Greater Lincolnshire Local Enterprise Partnership in their local skills report [134]

17.3 Baseline Conditions

17.3.1 A desk-based study will be undertaken to review the current policy regarding the local employment and economy drawing on information provided by councils and the local authority used to inform the Local Plan.

17.3.2 A collation of baseline data will consider key statistical information from a range of publicly available sources. Sources of information will include, but may not be limited to:

- 2021 Census – provision of local population profiles;
- travel to work data;
- NOMIS – Office for National Statistics (ONS) labour market statistics;
- Gross Value Added (GVA) – wealth from production of goods allowing comparison of regions of different sizes; and
- county and local authority data.

17.4 Receptors

17.4.1 Receptors and indicators will be defined from this data and will be used to characterise the socio-economic baseline of the region, as presented in Table 17-1.

Table 17-1 Receptors and Indicators to be used in Baseline Characterisation

Receptor	Indicator
Economic Activity	GVA
Employment	Employees
Access to Employment Opportunities for Local Residents	Unemployment Rate
	Skills Profile
	Claimant Count

17.4.2 While the Proposed Development lies within the North Lincolnshire local authority area, it is in close proximity to the border of North East Lincolnshire, and so the socio-economic impact assessment will include both areas within its scope. Other nearby areas such as West Lindsay local authority area and the wider Yorkshire and Humber region may also see socio-economic impacts from the Proposed Development. Information such as travel to work patterns from the 2011 Census will be used to determine the final study area.

17.4.3 The assessment will consider the effects of the Proposed Development at varying levels depending on the information available. These will include local government wards (the Site is located in Ferry ward), county and local authorities, regional and country levels.

17.4.4 Employment and earnings data based on NOMIS data for the economically active population in the local area are detailed in Table 17-2. This shows that the local authority area in which the Site is located resides in an area where both the employment levels and typical earnings are below the national average, implying that many jobs in the area are low paid.

Table 17-2 Comparison between Local, Regional and National Levels: Employment and Earnings for all Economically Active People

Indicator	North Lincolnshire	North East Lincolnshire	Lincolnshire	Yorkshire and the Humber	Great Britain
In employment %	74.0	69.3	73.7	73.1	75.5
Full-Time Workers Hourly Pay, £	15.64	15.85	15.82	15.93	17.49
Data from NOMIS Labour Market Profile Apr 2023 – Mar 2024					

17.5 Potential Effects

Construction

17.5.1 The construction phase is likely to generate a short term higher level of economic activity and employment. As FEED is progressed possible build options for the Proposed Development will be evaluated to allow the development of construction worker profiles, including indicative numbers and project duration, to support the ES.

Operation

17.5.2 The operational phase is likely to generate longer term levels of economic activity and employment. These will arise through both direct and indirect impacts, including job and wealth creation from the operation of the Proposed Development, as well as via the supply of goods and services in support of the operation of the Proposed Development. Wider socio-economic impacts have the potential to arise from the generation of by-products and through generation of business rates benefitting the local authority and its community.

17.5.3 Reference will also be made, although no quantitative assessment will be undertaken, to the role that the Proposed Development could play in supporting the aims of the North Lincolnshire Local Development Framework Core Strategy.

17.6 Determination of Significance

17.6.1 The sensitivity of the receptors is determined based upon the importance attached to each receptor in policy, and the use of professional judgement relating to the scale of socio-economic challenges faced by each receptor (following analysis of the baseline). The criteria followed in determining receptor sensitivity are set out in Table 17-3. The criteria are indicative and the assessment includes a reasoned justification explaining the criterion allocated to each specific receptor.

Table 17-3 Sensitivity Criteria

Sensitivity	Description
High	Evidence of direct and significant socio-economic challenges relating to the receptor; and/or Identification in policy as a key thematic or spatial priority.
Medium	Some evidence of socio-economic challenges linked to the receptor, which may be direct or indirect; and/or The receptor is identified in policy, but not as a key policy priority.
Low	Little evidence of socio-economic challenges relating to the receptor; and/or No identification in policy.

Negligible	No socio-economic issues relating to the receptor; and/or No particular economic weaknesses or challenges.

Magnitude of Change

17.6.2 The magnitude of change undergone by each receptor is determined by considering the likely deviation from baseline conditions. Magnitude criteria are set out indicatively in Table 17-4. Again, the assessment includes a reasoned justification explaining the criterion allocated to each specific receptor.

Table 17-4 Magnitude Criteria

Magnitude	Description
High	A large change to existing conditions, in terms of either absolute or percentage change.
Medium	A moderate change to existing conditions, in terms of either absolute or percentage change.
Low	A limited change to existing conditions, in terms of either absolute or percentage change.
Negligible	No tangible change from baseline conditions.

Significance of Effect

17.6.3 As described above, once the sensitivity of the receptor and the magnitude of change have been identified, these are considered together to determine whether the resultant effect is significant or not. The level of effect that would occur is determined guided by the matrix shown in Table 3-1.

17.7 Mitigation

17.7.1 The need for mitigation is expected to be minimal, given the generally beneficial effects of job creation on local socio-economics, however potential enhancement measures will be considered as part of the ES.

17.8 Proposed Assessment Methodology

Scope and Methodology

17.8.1 As discussed above, a desktop study will be undertaken to inform the current baseline using a number of receptors and key indicators.

17.8.2 The assessment will consider the potential effects of construction and operation on the identified socio-economic receptors taking into account the magnitude of the effect and the sensitivity of the

receptor to change. The significance of the impact will be determined by considering the predicted deviation from the baseline conditions, and a reasoned judgement given.

17.9 Cumulative Effects

17.9.1 The socio-economic impacts of the Proposed Development, particularly during the construction phase, will be spread over a large portion of the surrounding area, as workers will commute variable distances to site. As a result, the cumulative effects of the Proposed Development alongside other significant developments within the study area defined for the socio-economic assessment will be considered.

18 ENVIRONMENTAL FACTORS SCOPED OUT OF THE EIA

18.1 Flood Risk

18.1.1 As the Main Site of the Proposed Development is designated as Flood Zone 1 (see Figure C1-1), the probability of flooding (tidal and fluvial) is defined as less than 1 in 1,000 years. From BGS surveys, the majority of the Site is covered with low permeability surfacing, and as low permeability Till is present beneath the Site, there is likely no significant potential for increase in groundwater level to surface elevation. The indicative eastern pipeline route extends across Flood Zones 1, 2 and 3 (see Figure C1-1), requiring assessment of tidal flood risk along that indicative route (see section 18.1.4). Any increase to surface water flood risk can be fully mitigated by on-site drainage design in accordance with national and local policy and guidance.

18.1.2 Hence, it is proposed that the impacts relating to flood risk to/from the Proposed Development will not be significant and can therefore be scoped out of the ES.

18.1.3 More detail on the justification for scoping flood risk out can be found in Appendix C which includes a full desk-based study into flood risk for the proposed Development

18.1.4 Although a Flood Risk Assessment (FRA) will not be included within the ES, a FRA will be prepared as part of the planning application as required for developments greater than 1 ha. The FRA for the planning application will be prepared, considering flood risk from all sources, including allowance for climate change. The FRA will also include assessment of the potential effect of the Proposed Development on flood risk elsewhere. As the Main Site of the Proposed Development would be located in Flood Zone 1, the FRA will focus particularly on provision for management of surface water within the Site to achieve no net increase in off-site surface water discharge in accordance with national and local sustainable drainage policy. Within the FRA, an assessment of tidal flood extents, levels and hazard will be undertaken for any sections of the final pipeline route that would extend through Flood Zones 2 and 3, see section C1.7 for further information on the proposed assessment methodology.

18.2 Aviation

18.2.1 Whilst the Civil Aviation Authority (CAA) has a role in providing relevant aviation safety advice upon request, aside from cases that may involve CAA property, the CAA is not routinely a statutory consultee for planning applications. When not a statutory consultee the CAA will only respond to planning enquiries where there is something definitive to contribute; where this is not the case the CAA will not respond [135].

18.2.2 The CAA has a general interest in tall structures as follows:

1. For civil aviation purposes, there is a mandated requirement to declare and chart all known structures of a height (i.e., above ground level) of 100 m or more.
2. There is a mandated requirement for structures of a height of 150 m or more to be equipped with aviation warning lighting, structures of lesser height may need to be lit if, by virtue of their location and nature, they are considered a significant navigational hazard.

3 As a minimum it is recommended that all proposed developments over 90 m in height should be notified to the CAA.

18.2.3 The height of the oxygen and hydrogen vents will principally be determined by assessment and dispersion modelling completed as part of the air quality assessment (see section 6). Nonetheless, a worst-case tallest structure height is assumed to be approximately 30 m and in the context of the surrounding industry it is not a navigational hazard as the nearest aerodrome, the Humberside International Airport, is 9.3 km south-west of the Proposed Development.

18.2.4 As the Proposed Development will periodically vent hydrogen and oxygen, the CCA will be notified. However given the volume and pressure of the vented gases associated with the Proposed Development, along with the context of the surrounding industry and flaring activities, the it is proposed that the potential aviation impacts will not be significant and the factor can be scoped out of the ES.

19 SUMMARY OF POTENTIAL EFFECTS TO BE CONSIDERED

19.1.1 This Scoping Report has identified the environmental impacts relevant to the Proposed Development that are considered to be potentially significant, therefore acting as the basis for the initial scope of the ES.

19.1.2 A summary of the potential effects which will form the scope of each environmental factor assessed within the EIA can be found in Table 19 1. This table also includes the potential impacts deemed insignificant (and therefore scoped out), along with the justification for this determination, as discussed within the relevant environmental factor chapter (sections 6 – 17).

Table 19-1 Potential Effects Considered Within the Scope of the EIA

Environmental Factor	Scoped In	Scoped Out	Justification for Scoping Out
Air Quality			
Construction	• Construction dust emissions from Main Site (Chase Hill Woods LWS only) • Construction dust emissions from West Pipeline Routes (Human receptors within 250m and Eastfield Road Railway Embankment LWS) • Construction dust emissions from Eastern Pipeline Route (Workplace receptors, Burkinshaw's Covert LWS, Station Road Field LWS and Rosper Road Pools LWS only). • Construction Plant Traffic	• Construction dust emissions for all receptors greater than 250 m from the Proposed Development. • Construction Plant Exhaust Emissions	• IAQM guidance for the assessment of dust emissions from construction recommends that residual impacts from construction dust can be screened out for human health and amenity receptors at a distance of greater than 250 m from the development site and residual impacts from construction dust can be screened out for ecological receptors greater than 50 m from the development site and 250 m from the site entrance. • Emissions will be small and temporary resulting in negligible off-site exposure levels
Operation	• Auxiliary plant emissions	• Operational vehicle emissions	• There will be no significant increase in operational traffic numbers and as such these will screen out against the IAQM assessment guidance.
Water Quality			
Construction	• Pollution of surface watercourses within or near the Site	• Changes to surface water flows • Temporary/permanent loss of intertidal habitat	• Any discharge flow rates during construction will be very small compared with tidal flow in estuary and will be temporary • No interaction with intertidal region expected
Operation	• Heat (elevated temperature) discharged to surface water • Pollutants discharged to surface water	• Changes to surface water flows	• Discharge flow rate very small compared with flow tidal flow in estuary
Ground Conditions			

Environmental Factor	Scoped In	Scoped Out	Justification for Scoping Out
Construction	• Disturbance of potentially contaminated soils and groundwater and creation of new pathways allowing contamination to reach sensitive receptors (including construction workers and controlled waters) during construction; • Hazardous ground gas generation and accumulation from organic rich strata, presenting a risk of explosion or asphyxiation to future site users; • Potential of introducing contaminants to the ground or controlled waters from plant and equipment leaks, and /or stored materials by run-off or vertical migration • Exposure of construction workers, site users and / or neighbours to potentially contaminated dust during construction activities; and • Structures impacted by ground stability issues such as subsidence, due to the presence of compressible strata.		
Operation	• Potential of introducing contaminants to the ground or controlled waters from plant and equipment leaks, and /or stored materials by run-off or vertical migration		
Waste and Material Management			
Construction	• Effects on consumption and demand of materials (loss of resources) • Effects on inert and non-hazardous landfill capacity (regional) and hazardous landfill capacity (national)	• Effects on mineral safeguarding sites and peat resources in the proximity of The Proposed Development	• The Proposed Development is not located in proximity to any mineral safeguarding sites or peat resources

Environmental Factor	Scoped In	Scoped Out	Justification for Scoping Out
	• Effects on baseline of waste generated		
Operation	• Changes in baseline waste arisings • Changes in landfill capacity	• Changes in availability of materials	• The consumption of materials during the operational phase will be negligible and will be confined to periodic replacement of equipment
Noise and Vibration			
Construction	• Noise from activities on site and along pipeline routes • Noise and vibration from construction traffic on public roads	• Vibration from activities on site	• All sensitive receptors are further than the 100 m distance that British Standard BS5228 indicates vibration generating activities such as earthworks and impact piling do not produce significant vibrational effects beyond.
Operation	• Noise from Proposed Development	• Vibration from Proposed Development • Noise and vibration from operation traffic on public roads	• All sensitive receptors are further than the 100 m distance that British Standard BS5228 indicates vibration generating activities such as earthworks and impact piling do not produce significant vibrational effects beyond. • Low number of additional journeys
Landscape and Visual Amenity			
Construction	• Temporary changes to views • Permanent changes to views from the removal of vegetation with potential screening effects	• Effects on designated and designed landscapes • Effects of lighting	• The Proposed Development would not be visible from within the Lincolnshire Wolds National Landscape or Brocklesby Park RPG • Lighting would not be uncharacteristic of the locality and would be localised and mitigated to a degree using industry standard approaches
Operation	• Permanent changes to the views from new buildings and structures.	• Effects on designated and designed landscapes • Effects of lighting	• The Proposed Development would not be visible from within the Lincolnshire Wolds National Landscape or Brocklesby Park RPG • Lighting would not be uncharacteristic of the locality and would be localised and mitigated

Environmental Factor	Scoped In	Scoped Out	Justification for Scoping Out
			to a degree using industry standard approaches
Traffic and Transport			
Construction	• Increased traffic generated and associated impacts		
Operation		• Increased traffic generated and associated impacts	• Low number of additional traffic from low number of operational staff and HGV movement
Cultural Heritage			
Construction	• Physical impacts on heritage assets within the Site • Impacts on the setting of heritage assets, including historic landscape character areas, in the vicinity of the Site		
Operation	• Impacts on the setting of heritage assets, including historic landscape character areas, in the vicinity of the Site		
Ecology			
Construction	• Temporary loss and fragmentation of habitats within and around the Proposed Development • Loss or disturbance of functionally linked habitats used by qualifying resources of the SPA • Disturbance arising from noise, dust, water or air pollution caused by construction activities and lighting		

Environmental Factor	Scoped In	Scoped Out	Justification for Scoping Out
Operation	• Permanent loss and fragmentation of habitats within and around the Proposed Development • Disturbance arising from operational noise and lighting • Potential beneficial effects of new landscaping measures and biodiversity enhancements.		
Climate Change			
Construction	• CO2 and other GHG emissions released from construction activities.		
Operation	• Potential CO_2 reduction of CO_2 emitting industry • Impact of changing ambient on overall plant performance • Overall resilience of the Proposed Development to climate change impacts	• Flooding impacts related to future climate change	• Future flooding risk will be covered within the FRA which will be produced separately to the EIA
Major Accidents and Disasters			
Construction	• Explosion or fire • Incident at a COMAH establishment (Domino effect)	• Ground Collapse, Severe Weather, Chemical leaks into the environment and road traffic accidents • Earthquakes • Aircraft impacts	• Potential effects already covered within other EIA factors. • The Proposed Development is not located within a tectonically active area. • Construction structures will only be present temporarily and not expected to be taller smaller existing structures in the immediate vicinity, therefore will not be an navigational hazard.

Environmental Factor	Scoped In	Scoped Out	Justification for Scoping Out
Operation	• Explosion or fire • Incident at a COMAH establishment (Domino effect) • Release of an asphyxiant gas • Utilities failure (gas, electricity, water, sewage, etc.)	• Ground Collapse, Severe Weather, Chemical leaks into the environment and road traffic accidents • Earthquakes • Aircraft Impacts • Terrorism / Vandalism	• Potential effects already covered within other EIA factors. • The Proposed Development is not located within a tectonically active area • Operational structures will not be tall enough to be deemed an obstacle to aircraft and in the context of the surrounding industry will not be a navigational hazard • The Proposed Development will be designed and operated with security controls in order to reduce the potential of this event.
Socio-Economics			
Construction	• Creation of direct and in-direct employment		
Operation	• Creation of direct and in-direct employment • Longer term economic activity from business supporting of the Proposed Development		

20 STRUCTURE OF THE ES

20.1 Proposed Structure of the ES

20.1.1 The proposed structure of the ES is shown below. It will be produced in four volumes: the first of which is the Main Report, the second comprises the illustrative Figures and the third a series of Technical Appendices containing data and technical assessments undertaken for the ES chapters. The final volume is the Non-Technical Summary.

- Volume 1 – ES Main Report

Section	Content
1.0	Introduction
2.0	Proposed Development Description
3.0	Alternatives Considered
4.0	EIA Methodology
5.0	Planning Policy
6.0	Air Quality
7.0	Water Quality
8.0	Ground Conditions
9.0	Materials & Waste Management
10.0	Noise & Vibration
11.0	Landscape and Visual Amenity
12.0	Traffic & Transport
13.0	Cultural Heritage
14.0	Ecology
15.0	Climate Change
16.0	Major Accidents & Disasters
17.0	Socio-Economics
18.0	Cumulative Effects and Combined Effects
19.0	Summary of Environmental Effects

- Volume 2 – ES Figures
- Volume 3 – Technical Appendices
- Volume 4 – Non-technical summary

20.2 Format of the ES

20.2.1 It is proposed the ES be submitted in an electronic format only, with file sizes suitable for uploading on NLC's planning portal. Hard and electronic copies (on a CD) will be available for

purchase. The ES foreword will outline the cost of purchasing the ES in its various formats and from where copies can be obtained.

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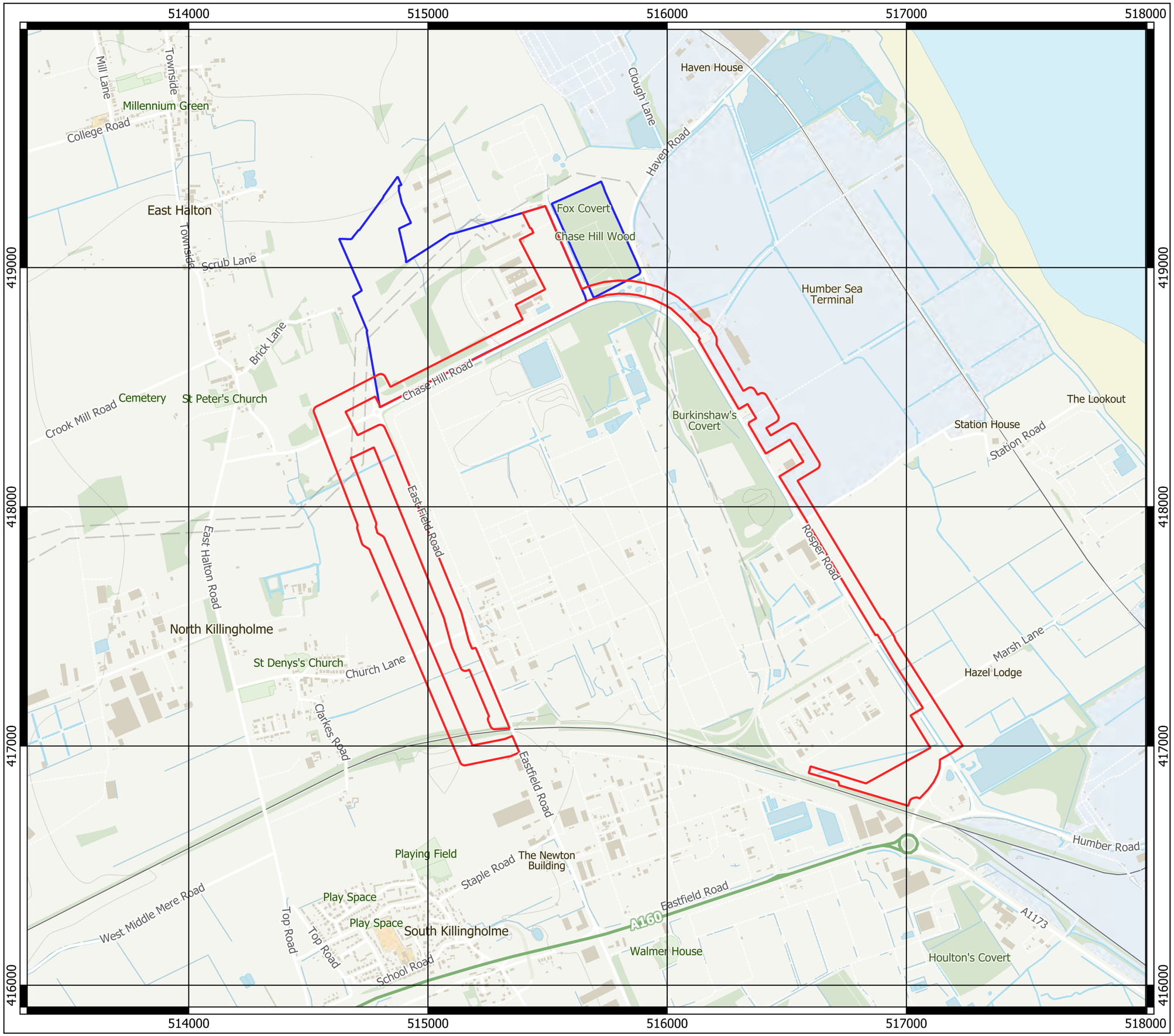
APPENDIX A
MAPS

A1 MAPS

Map	Map Title
2-1	Site Boundary
2-2	Indicative Pipeline routes
6-1	Residential Receptors
6-2	Environmental Constraints Plan - 2 km
6-3	Environmental Constraints Plan – 10 km
7-1	Existing Killingholme Intake and Outfall locations
11-1	Site Location
11-2	Site Context
11-3	Topography and Landcover
11-4	Landscape Character
11-5	Initial standard screening ZTV and Proposed Viewpoints
13-1	Extract of North Lincolnshire HER



uniper

Legend

- Uniper Ownership
- Scoping Boundary

Notes

0 250 500 750 m

N

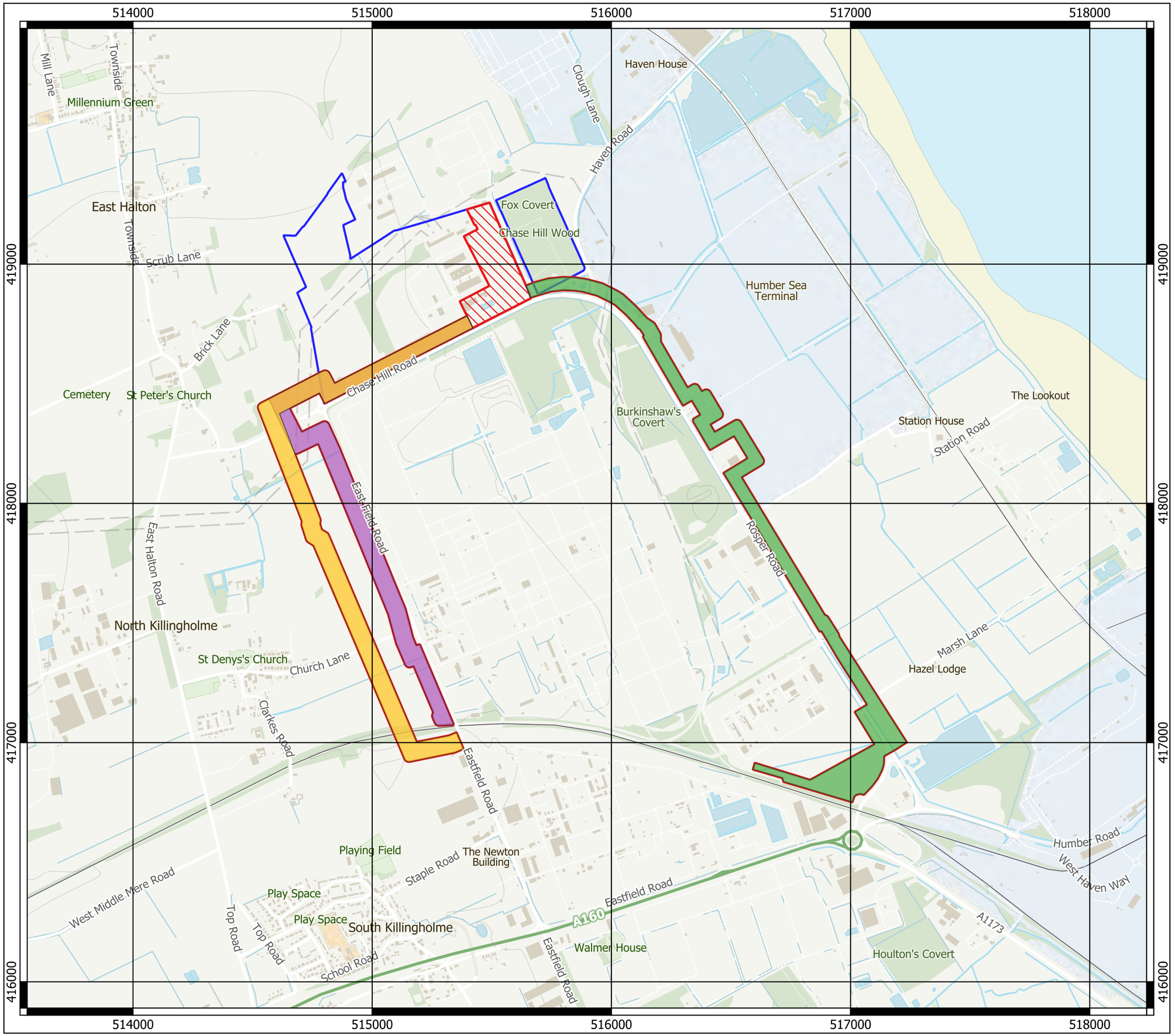
1:15000 @A3

Humber H2ub® (Green) - EIA Scoping Report

Map 2-1

Site Boundary

05/08/2024



Legend

- Uniper Ownership
- Scoping Boundary
- Main Site (HPF and auxilliaries)
- Indicative Eastern Pipeline Route
- Indicative Western Pipeline Route 1
- Indicative Western Pipeline Route 2

Notes

Pipeline routes shown within this map are indicative only.

0 250 500 750 m

N

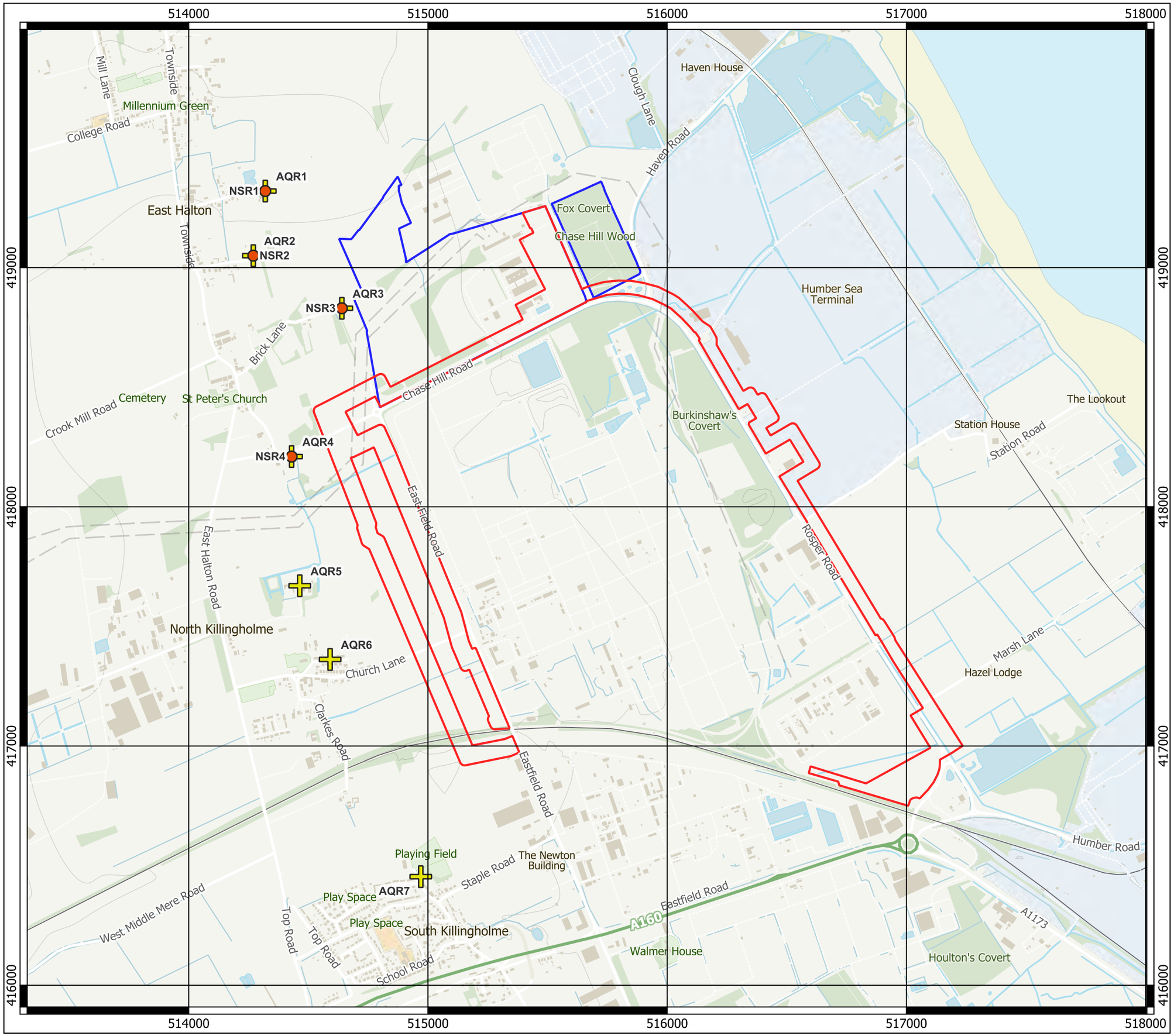
1:15000 @A3

Humber H2ub® (Green) - EIA Scoping Report

Map 2-2

Indicative Pipeline Routes

02/08/2024



Legend

- Uniper Ownership
- Scoping Boundary

HH2G Residential Receptors

- Air Quality Receptor
- Noise Sensitive Receptor

Air Quality Receptors	
Swinster Lane	AQR1
Scrub Lane (Roselea)	AQR2
Brick Lane (Fairfields)	AQR3
Chase Hill Road	AQR4
Manor Farm	AQR5
Church Lane, North Killingholme	AQR6
St Denys Close, South Killingholme	AQR7

Noise Receptors	
Swinster Lane	NSR1
Scrub Lane (Roselea)	NSR2
Brick Lane (Fairfields)	NSR3
Chase Hill Road	NSR4

Notes

Residential Receptors proposed for Air Quality and Noise and Vibration Assessments

0 250 500 750 m

N

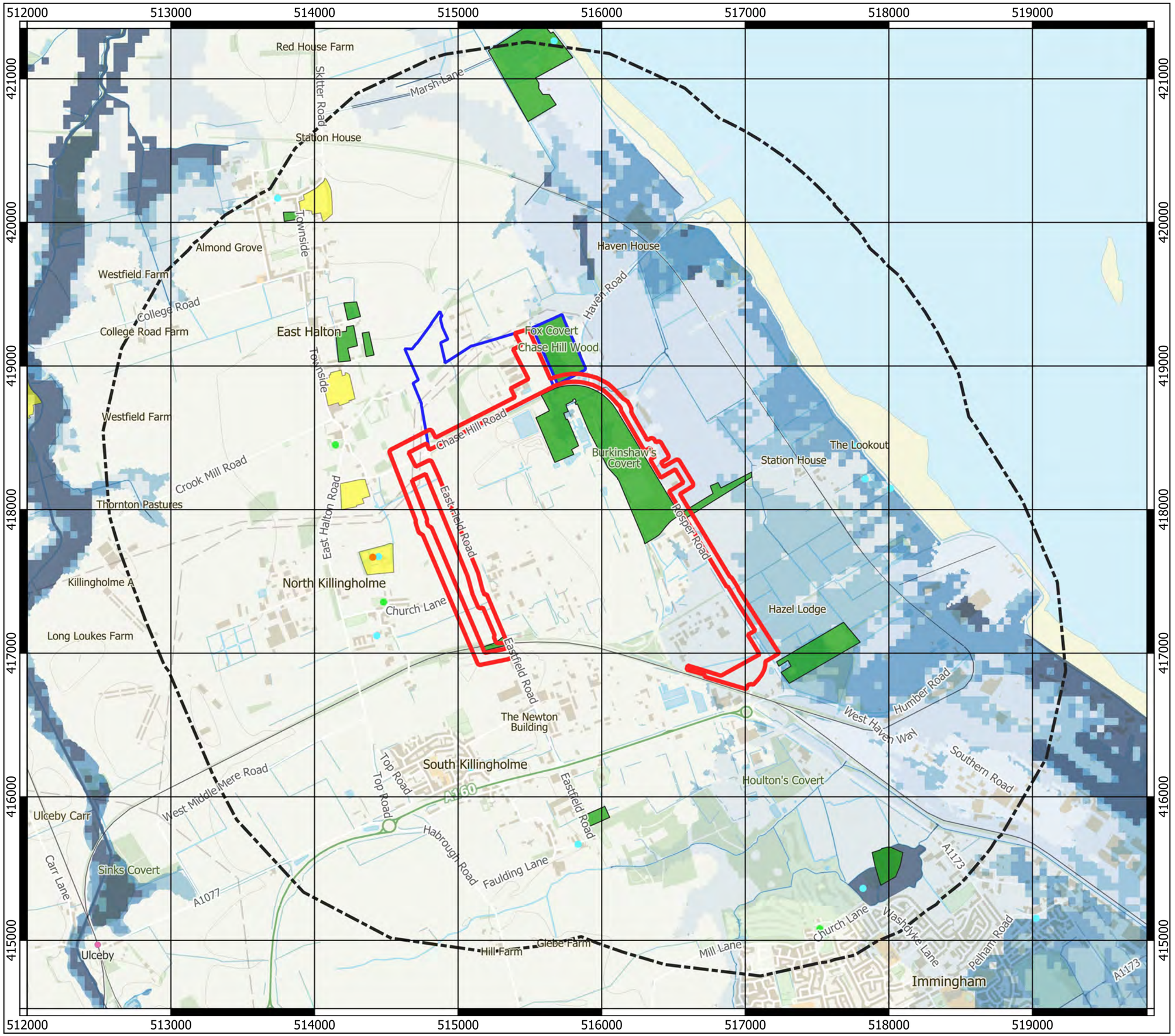
1:15000 @A3

Humber H2ub® (Green) - EIA Scoping Report

Map 6-1

Residential Receptors

05/08/2024



uniper

Legend

- Uniper Ownership
- Scoping Boundary
- 2 km Radius
- Local Wildlife Sites
- Scheduled Monuments

Listed Buildings

- I
- II
- II*

Risk of Flooding

- High
- Medium
- Low
- Very Low

Notes

0 250 500 750 m

1:25000 @A3

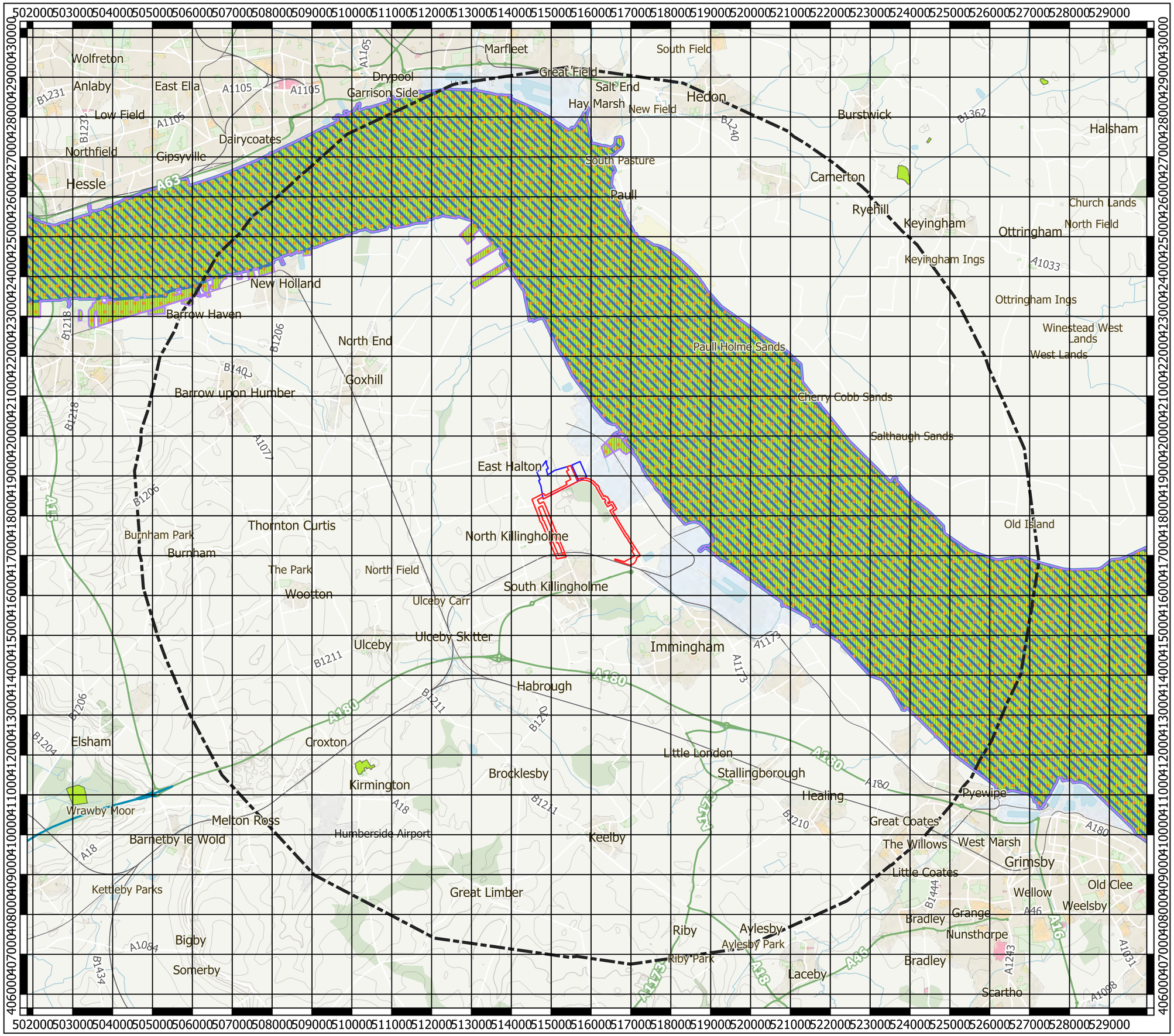
N

Humber H2ub® (Green) - EIA Scoping Report

Map 6-2

Environmental Constraints Plan - 2 km

02/08/2024



Legend

- Uniper Ownership
- Scoping Boundary
- 10 km Radius
- Sites of Special Scientific Interest England
- Special Areas of Conservation England
- Special Protection Areas England
- Ramsar England

Notes

0 2,500 5,000 m

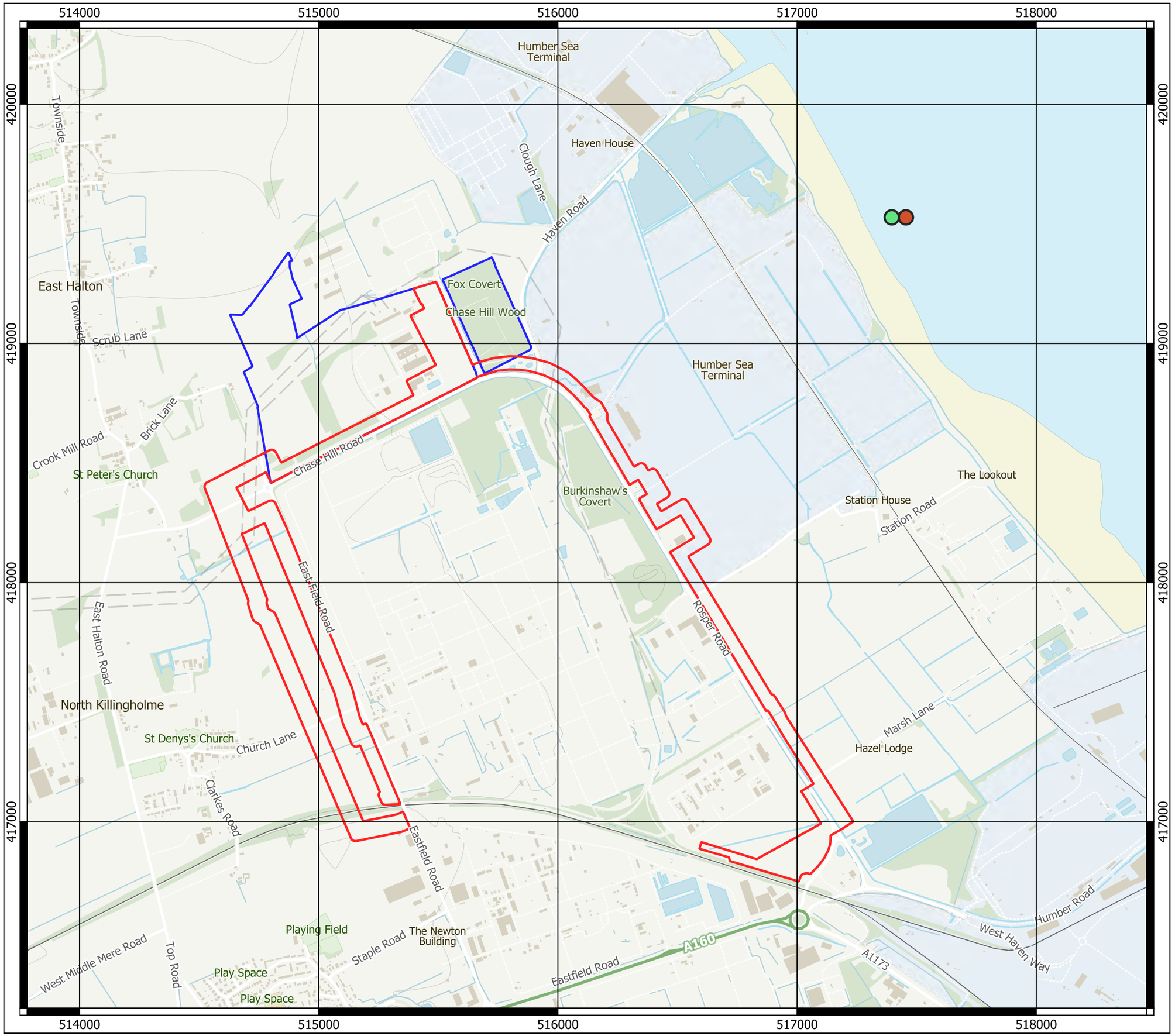
1:90000 @A3

Humber H2ub® (Green) - EIA Scoping Report

Map 6-3

Environmental Constraints Plan - 10 km

02/08/2024



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Legend

- Uniper Ownership
- Scoping Boundary
- Existing Intake
- Existing Outfall

Notes

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0 250 500 750 m

N

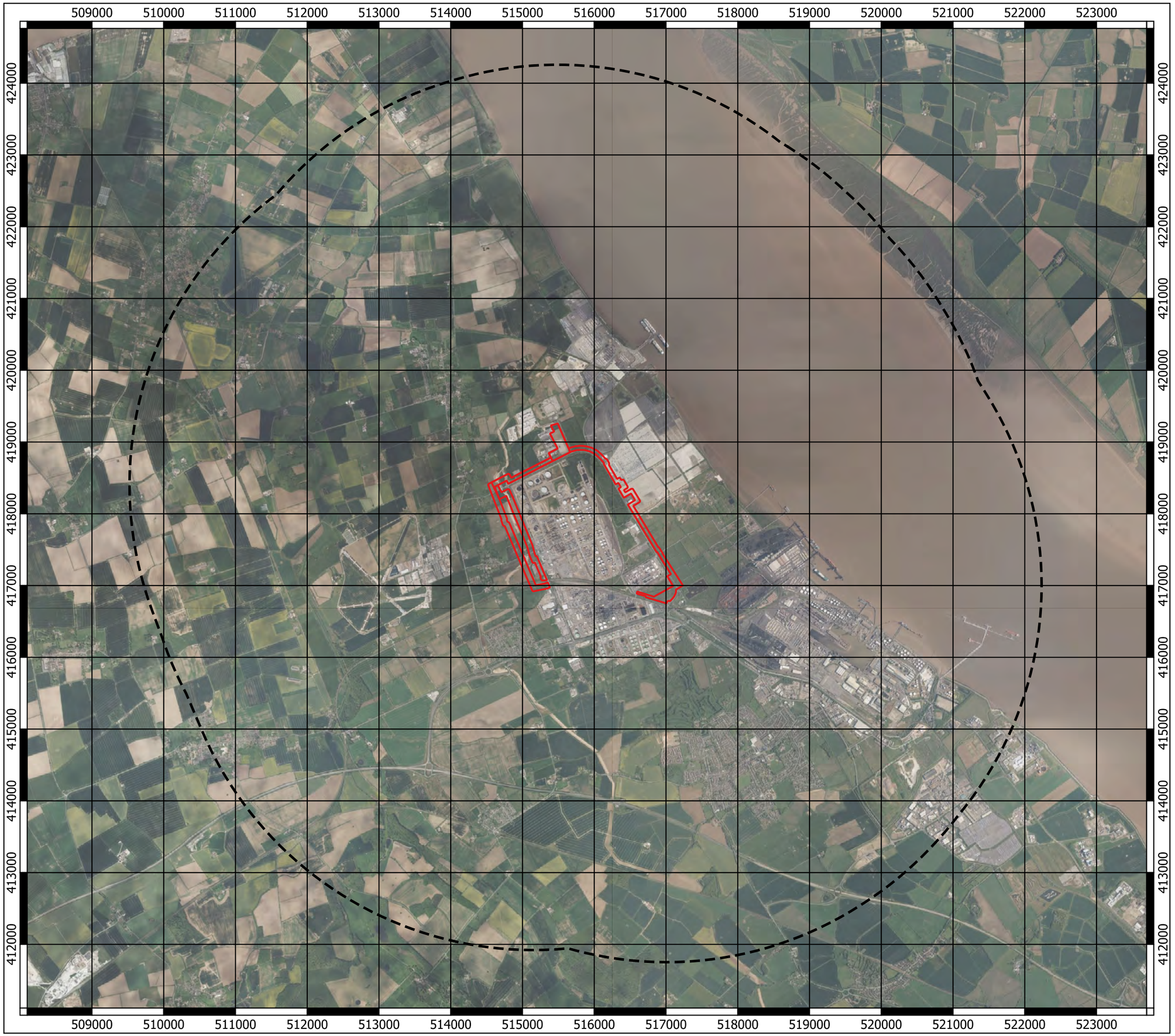
1:15000 @A3

Humber H2ub® (Green) - EIA Scoping Report

Map 7-1

Existing Killingholme Intake and Outfall locations

02/08/2024



uniper

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Planning, Landscape & Environment
an RSK company

Legend

- Scoping Boundary
- Distance Radius from Site (5km)

Notes

0 1.25 2.5 km

1:50000 @A3

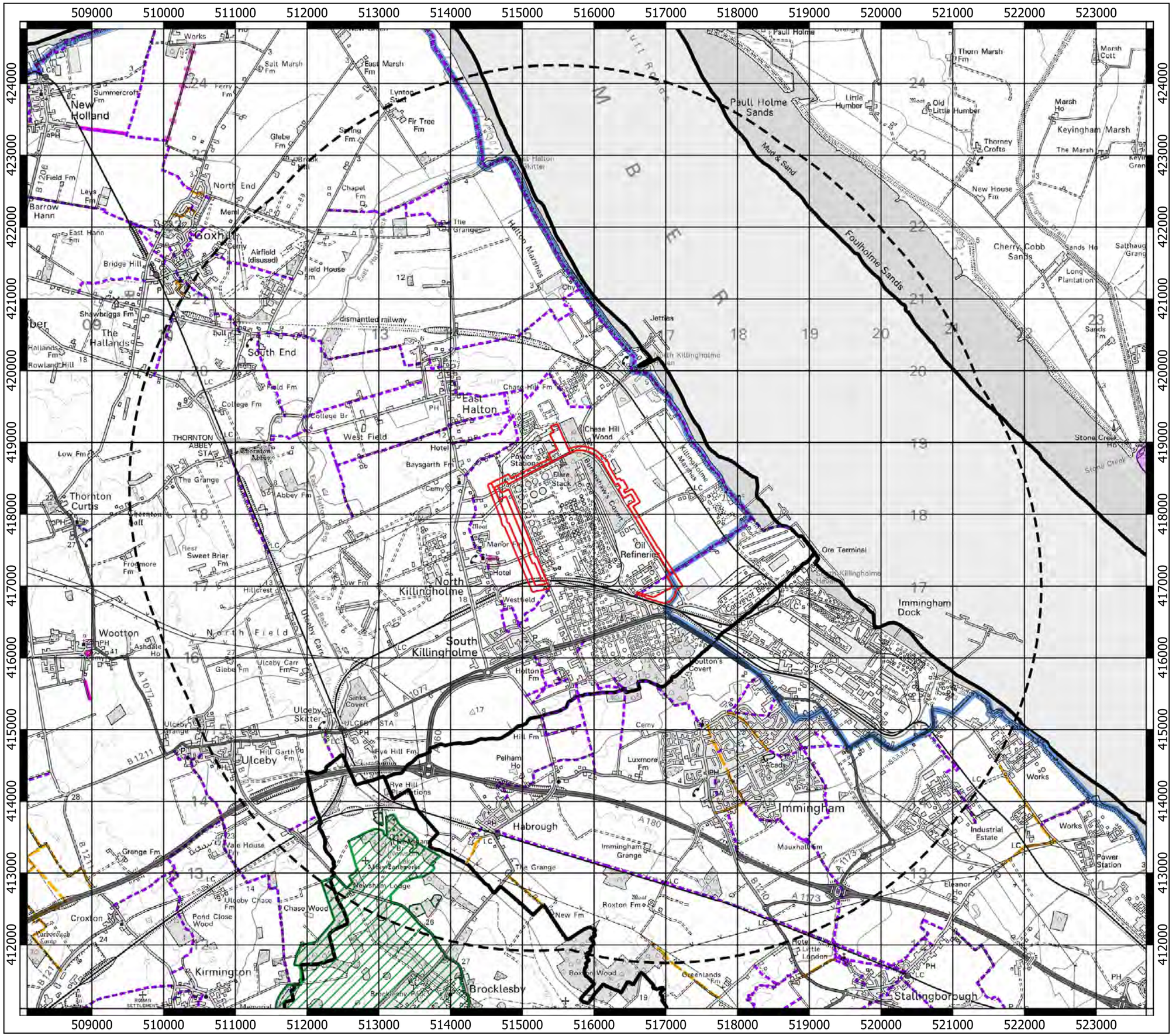
N

Humber H2ub® (Green) - EIA Scoping Report

Map 11-1

Site Location

23/07/2024



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Legend

- Scoping Boundary
- Distance Radius from Site (5km)
- Local Authorities
- Ancient Woodland
- Registered Parks and Gardens
- CRoW Open Access Land
- Conservation Areas
- Proposed Route of King Charles III England Coast Path

North Lincolnshire Public Rights of Way

- Footpath
- Bridleway
- BOAT

Notes

0 1.25 2.5 km

N

1:50000 @A3

Humber H2ub® (Green) - EIA Scoping Report

Map 11-2

Site Context

23/07/2024

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Legend

- Scoping Boundary
- Distance Radius from Site (5km)
- Watercourse/Waterbody
- Woodland

Elevation (AOD)

146

0

Notes

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0 1.25 2.5 km

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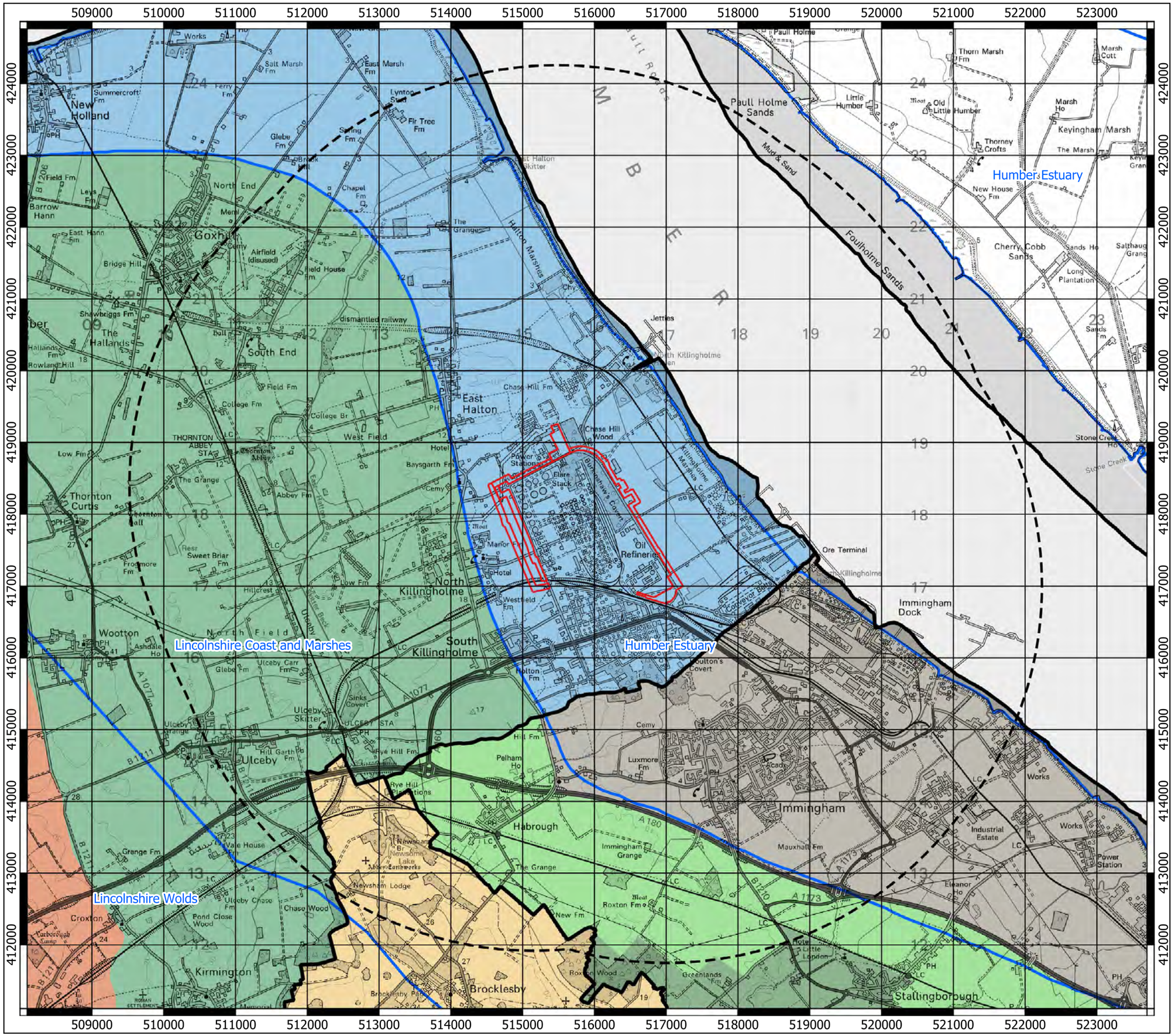
1:50000 @A3

Humber H2ub® (Green) - EIA Scoping Report

Map 11-3

Topography and Landcover

23/07/2024



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an RSK company

Legend

Site

- Scoping Boundary
- Distance Radius from Site (5km)
- Local Authorities
- National Character Areas

North Lincolnshire
Landscape Character Assessment (1999)

- Humber Estuary
- Lincolnshire Drift
- Lincolnshire Wolds

North East Lincolnshire
Landscape Character Assessment (2015)

- Industrial Landscape
- Open Farmland
- Wooded Open Farmland

West Lindsey
Landscape Character Assessment (1999)

- Wolds' Estates

Notes

0 1.25 2.5 km

N

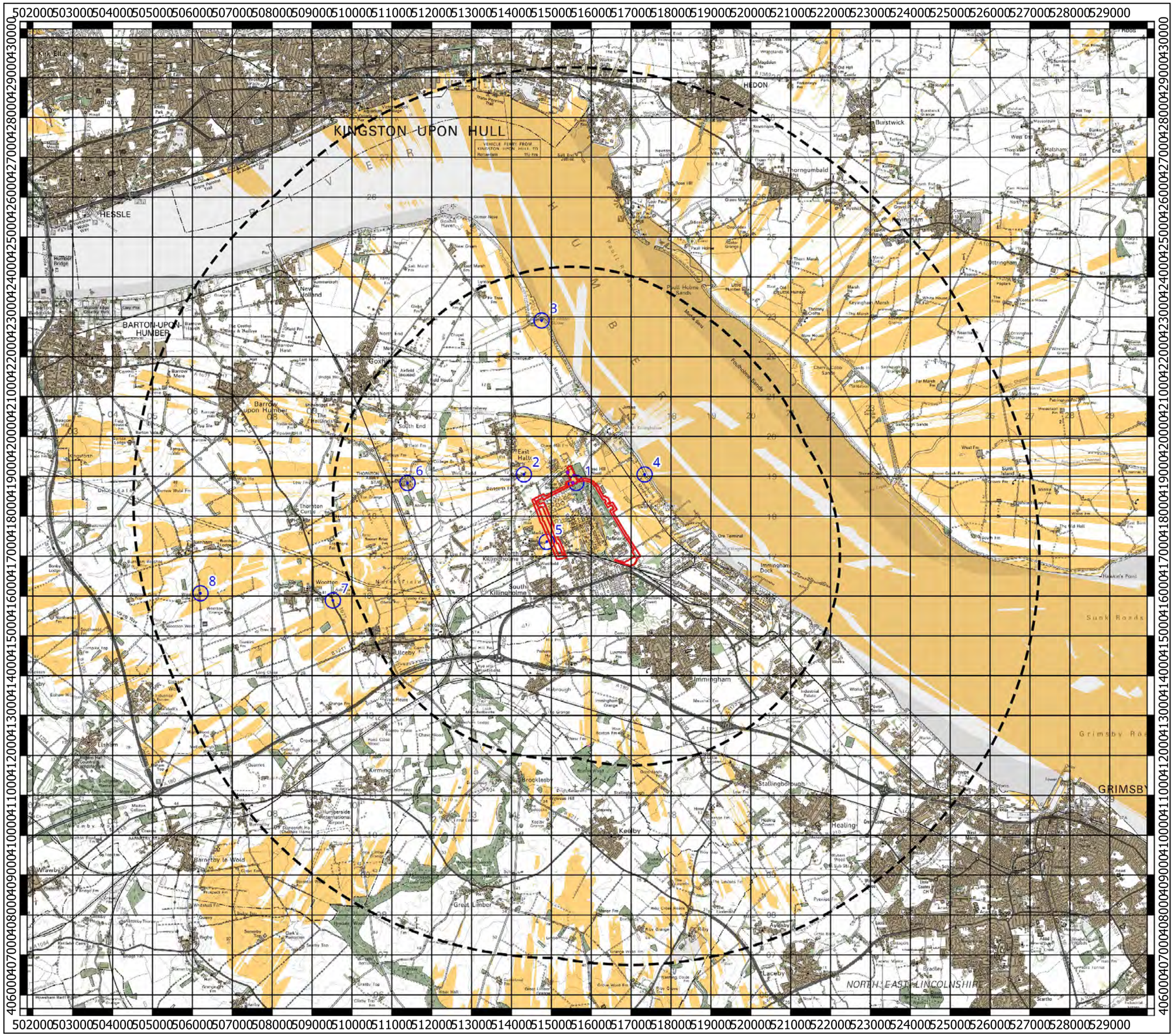
1:50000 @A3

Humber H2ub® (Green) - EIA Scoping Report

Map 11-4

Landscape Character

23/07/2024



Legend

- Scoping Boundary
- Vents
- Distance Radii from Site (5, 10km)
- Proposed Viewpoints
- Woodland
- Buildings

Zone of Theoretical Visibility

- 27m high vents may be visible

Notes

Layout file: D001-Obvs-27m-T5-10km.shp
Terrain data: LiDAR-2022-DSM-5m.asc
Viewer's eye height: 2m above ground level
Calculation grid size: 5m

This drawing is based upon computer generated Zone of Theoretical Visibility (ZTV) studies produced using the Viewshed routine in the Visibility Analysis plugin for QGIS.

The areas shown are the maximum theoretical visibility, taking into account topography, principal woodlands and buildings.

A digital surface model (DSM) has been derived from DEFRA National LiDAR Programme DTM height data with the locations of woodland and buildings taken from the OS Open Map Local dataset. Buildings have been modelled with an assumed height of 7.5m and woodland an assumed height of 15m, representing a conservative estimate of average heights within the study area.

The model does not take into account some localised features such as small copses, hedgerows or individual trees and therefore still gives an exaggerated impression of the extent of visibility. The actual extent of visibility on the ground will be less than that suggested by this plan.

The ZTV includes an adjustment that allows for Earth's curvature and light refraction. It is based on a derived DSM and has a 5m² resolution

0 2.5 5 km

1:90000 @A3

Humber H2ub® (Green) - EIA Scoping Report

Map 11-5

Initial standard screening ZTV and Proposed Viewpoints

23/07/2024

514000 515000 516000 517000

419000 418000 417000

Main Compound

East Pipeline Route

West 1 Pipeline Route

West 2 Pipeline Route

East Halton

North Killingholme

South Killingholme

uniper

Allenarchaeology

Legend

Scoping Boundary

Study Area (500m)

NLHER Summary [144]

- Prehistoric [31]
- Roman [17]
- Early medieval [1]
- Medieval [20]
- Post-medieval [23]
- Modern [34]
- Uncertain [18]

NLHER Monument Lines

- Post-medieval
- Modern
- Uncertain

NLHER Monument Polygons

- Prehistoric
- Roman
- Medieval
- Post-medieval
- Modern
- Uncertain

NLHER Ridge and Furrow

- Medieval

Scheduled Monuments

Notes

0 200 400 600 800 m

1:14000 @A3

N

Humber H2ub® (Green) - EIA Scoping Report

Map 13-1

Extract of North Lincolnshire HER

18/07/2024

APPENDIX B
CULTURAL HERITAGE HISTORIC ENVIRONMENT RECORDS TABLE

B1 CULTURAL HERITAGE

Table B1-1 List of Lincolnshire Historic Environment Record Entries within a 500m study area from the site outline

Site No.	HER No.	Grade & Listing No.	Easting	Northing	Description	Date
1	MLS21544		516925	417065	Worked flint was found during fieldwalking in 1999, and in the subsequent excavations in 2000 and 2001. Dating from the Late Mesolithic to the Early Bronze Age.	Prehistoric
2	MLS19797		515990	419280	Flint core found in 1999.	Prehistoric
3	MLS19800		516360	418945	Four flint flakes found east of Rosper Road in 1999. Dating from the Late Mesolithic to Late Neolithic.	Prehistoric
4	MLS19801		516490	418780	Three flint flakes found east of Rosper Road in 1999. Dating from the Late Mesolithic to Late Neolithic.	Prehistoric
5	MLS19802		516350	418700	Five flint flakes found east of Rosper Road in 1999. Dating from the Late Mesolithic to Late Neolithic.	Prehistoric
6	MLS19803		516380	418470	Single flint flake found east of Rosper Road in 1999. Dating from the Late Mesolithic to Late Neolithic.	Prehistoric
7	MLS19805		516590	418970	Single flint flake found east of Rosper Road in 1999. Dating from the Late Mesolithic to Late Neolithic.	Prehistoric
8	MLS20198		515879	419131	Rod microlith and two flakes, found in 2004.	Prehistoric
9	MLS19726		516850	417915	Late Mesolithic core and three flakes found South of Station Road in 1999	Prehistoric
10	MLS20440		516371	418813	An assemblage of Mesolithic, Neolithic and	Prehistoric

				Early Bronze Age flint was found during an evaluation in 2006.	
11	MLS22737	516536	418328	7 pieces of Neolithic-Bronze Age worked flint were collected in two adjoining fields during fieldwalking in 2012.	Prehistoric
12	MLS19727	516880	418270	Neolithic scraper, cores and flakes, found north of Station Road in 1999	Prehistoric
13	MLS22487	516480	417960	A fragment of a Neolithic polished stone axe was found during weeding in 2012.	Prehistoric
14	MLS1622	514462	417495	Two stone axes found.	Prehistoric
15	MLS26743	517283	417744	A former stream valley of later prehistoric date has been identified by a transect of auger samples.	Prehistoric
16	MLS21553	517458	416786	A deposit of burnt stone and charcoal flakes was recorded during an archaeological evaluation in 2009. It was radiocarbon dated to the Late Bronze Age.	Prehistoric
17	MLS20125	515945	418667	Early Bronze Age scraper was found during a watching brief in 2002.	Prehistoric
18	MLS21554	517416	416829	Early Bronze Age ditch was recorded during an evaluation in 2009.	Prehistoric
19	MLS27187	517125.3509	416961.3316	Two post holes were identified in a trial trench in 2023 with the remians of timber posts. One of which was radiocarbon dated to the Middle Bronze Age.	Prehistoric
20	MLS20422	516635	417601	An Iron Age ditch, running parallel to Rosper Road for over 400 metres, was recorded as part of an evaluation in 2006. Other small drainage or boundary	Prehistoric

				features on the site are likely to date from the same period.	
21	MLS20441	516355	418823	An Iron Age enclosure, detected by geophysical survey in 2005 was excavated in 2013. Three inhumations and a cremation were recovered.	Prehistoric
22	MLS22603	514866	417773	A rectangular enclosure of Iron Age date, detected during a geophysical survey. A trial trench dug in 2012 revealed Iron Age ditches and finds.	Prehistoric
23	MLS20140	516240	419167	Rectangular enclosure east of Rosper Road, detected by geophysical survey in 2003. Two trenches were excavated in 2004, the enclosure was found to surround a Mid-Late Iron Age roundhouse. An open area excavation in 2006 recorded 3 roundhouses and 2 large enclosures.	Prehistoric
24	MLS20124	516552	417594	Cropmark ditches and sub circular features identified during aerial photographic transcription in 2002. Evaluations in 2006 found Iron Age ditches in the area of 'Site 13', but no trace of archaeological features in the south and west.	Prehistoric
25	MLS22604	514740	418278	Iron age square enclosure was found during archaeological works, evidence of metal working was found on the site.	Prehistoric
26	MLS21567	516729	418357	Iron Age - Romano-British settlement was excavated in 2015. Six inhumations were recorded on the site.	Prehistoric
27	MLS19771	516730	417164	An Iron Age and Romano-British settlement was excavated on the site on the Conoco CHP plant	Prehistoric

				between 2000 and 2002.	
28	MLS21556	517500	416766	Archaeological trial trenching in 2009 revealed a late prehistoric and Roman settlement. Salt-making and iron smelting may have been occurring nearby.	Prehistoric
29	MLS21569	517020	417855	Iron Age and early Roman enclosures. The site was excavated in 2013.	Prehistoric
30	MLS21568	516988	418302	A large main sub-rectangular enclosure, which contained several ring gullies and other fragmentary structural elements was found during excavation in 2014. Thought to date from mid to late Iron Age through to the early C2.	Prehistoric
31	MLS22428	517071	416846	Archaeological works uncovered a small Late Iron Age enclosed settlement that saw activity into the Early Roman period.	Prehistoric
32	MLS26159	516983	418311	A double-ditched penannular enclosure is visible on aerial photographs. The feature is clearly of prehistoric date and may be a later Neolithic or Bronze Age ritual site or a later prehistoric settlement enclosure. An archaeological evalution recovered Roman pottery but a ring-ditch was not described.	Roman
33	MLS19796	516020	419300	Single greyware sherd found in 1999.	Roman
34	MLS19804	516600	418880	Single greyware sherd found east of Rosper Road in 1999.	Roman
35	MLS19806	516660	418230	Single greyware sherd found north of Station Road	Roman

				in 1999.	
36	MLS19807	516720	417960	Single greyware sherd found south of Station Road in 1999.	Roman
37	MLS20423	516538	417767	8 sherds of Roman pottery, found in an unstratified context during an evaluation in 2006.	Roman
38	MLS4637	515100	418000	Romano British pottery.	Roman
39	MLS20093	515905	419147	Romano-British enclosures detected by geophysical survey.	Roman
40	MLS21335	515909	419456	Ditches dating from the late C2 and early C3 were identified during archaeological works.	Roman
41	MLS20199	515878	419127	Roman occupation, C1 -C4.	Roman
42	MLS22743	517015	417476	Later Roman ditches, possible continuation of a small farmstead or settlement recorded on the west side of Rosper Road.	Roman
43	MLS15871	514452	417939	A Romano British ditch containing pottery and medieval pottery were found during an archaeological watching brief.	Roman
44	MLS20144	515990	419427	Romano-British enclosure and field system confirmed by excavations in 2005 and 2006.	Roman
45	MLS22605	514874	416689	A Roman settlement was investigated by geophysical survey, fieldwalking and evaluation trenches in 2011 and 2012.	Roman
46	MLS1628 & MLS1630	515100	417800	Occupation site found during the construction of Lindsey Oil Refinery.	Roman
47	MLS1623	515744	419654	Romano British occupation site, Killingholme Haven.	Roman

48	MLS20145		515197	419697	Roman agricultural site dating C2 - C3. The main activity appeared to be cereal processing.	Roman
49	MLS19659		514635	417187	Anglo Saxon and Medieval pottery, east of Pond House, 1999.	Early Medieval
50	MLS1619		514300	418300	Lobingham Deserted Medieval Village	Medieval
51	MLS1621		514800	416800	Holtham Deserted Medieval Village	Medieval
52	DLS1710	SM/1007 813	514169	418842	Moated site & associated earthworks at Baysgarth Farm.	
53	MLS1624	SM/1008 044	514518	417621	Medieval moated site, Manor Farm.	Medieval
54	MLS1627	SM/1007 815	514300	418200	Medieval moated site, `North Garth'.	Medieval
55	MLS1606		514841	416487	Medieval moated site, `Blow Field'	Medieval
56	MLS24735		514122	418666	Medieval stonework from Thornton Abbey, reused mainly as decorative features at Baysgarth Farm.	Medieval
57	MLS20121		516505	417943	A hedgerow which forms the parish boundary between North and South Killingholme, east of the refinery, is shown on enclosure maps, and may be medieval in origin.	Medieval
58	MLS26757		516887	418440	Possible former sea bank of medieval date recorded 2010-14. The earthwork was destroyed in 2017.	Medieval
59	MLS20104		515996	416693	Medieval ridge and furrow.	Medieval
60	MLS20098		515390	418037	Medieval ridge and furrow.	Medieval
61	MLS26174		516311	418725	Medieval ridge and furrow. Truncated.	Medieval
62	MLS26164		516746	418810	Medieval ridge and furrow.	Medieval

					Now levelled.	
63	MLS26163		515522	419533	Medieval ridge and furrow. Now levelled.	Medieval
64	MLS26162		516104	419093	Medieval ridge and furrow. Now levelled.	Medieval
65	MLS26160		516838	418342	Medieval ridge and furrow. Now levelled.	Medieval
66	MLS1601	I/1103729	514140	418440	St. Peter's Church. Parish church. C13 chancel, C14 remainder, with some re-used C12 moulded stone. Restorations undertaken in 1868 by J Fowler of Louth.	Medieval
67	MLS1618	I/1103701	514470	417350	Church of St Denys. Parish church. C12 tower arch, C13 chancel with later C13 - C14 windows, C14 nave arcades, aisles and lower stages to tower with C15 upper stage, C16-C17 clerestory and windows to south aisle. Restorations undertaken C18, 1847, 1868, 1889,1910, and 1926.	Medieval
68	MLS20424		516572	417336	A shallow ditch containing a medieval sherd, found during an evaluation on land west of Rosper Road in 2006.	Medieval
69	MLS1620		514552	417339	Medieval and post-medieval settlement & shrunken Medieval village earthworks	Medieval
70	MLS7859	II*/1346854	514406	417668	Manor Farmhouse, C16 east wing, C17 west wing. Late C19 porch, extensions and alterations. Brick. Pantile roof. L-shaped on plan.	Post-medieval
71	MLS8609	II/1214980	514447	417671	Stables/granary approx 50m east of Manor Farmhouse. Mid C18 stable/granary.	Post-medieval
72	MLS25020		514446	417675	Manor Farm. Partially extant C18 unlisted	Post-

				farmstead.	medieval
73	MLS25018	514516	418816	Priory Farm. Partially extant C19 unlisted farmstead.	Post-medieval
74	MLS25021	514487	417422	Church Farm. Extant 19 unlisted farmstead.	Post-medieval
75	MLS25024	514564	417199	Walnut Tree Farm. Partially extant C19 unlisted farmstead.	Post-medieval
76	MLS25026	514685	416778	Weestfield Farm. Extant C19 unlisted farmstead.	Post-medieval
77	MLS24980	514142	418680	Bassgarth Farm (Bsss Garth). Extant C19 unlisted farmstead.	Post-medieval
78	MLS25017	514165	418511	Church Side Farm. Partially extant C19 unlisted farmstead.	Post-medieval
79	MLS24846	514888	416503	Site of (Moat House), a demolished 19 unlisted farmstead.	Post-medieval
80	MLS24966 & MLS8214	515452	419662	Site of Chase Hill Farm. Demolished C19 unlisted farmstead.	Post-medieval
81	MLS25013	516879	417454	Site of unnamed unlisted farmstead. Demolished C19.	Post-medieval
82	MLS25023	514485	417273	Site of unnamed, unlisted farmstead. Demolished C19.	Post-medieval
83	MLS21161	515148	419668	Ingold Toft Farm (site of), printed and shown on the 1824 OS map. There may have been a farmstead at this location during the Danelaw.	Post-medieval
84	MLS20138	516114	419307	Unnamed farm buildings east of Chase Hill Wood demolished before 1945.	Post-medieval
85	MLS24965	516113	419321	Site of unnamed outfarm. Demolished C19.	Post-medieval
86	MLS25014	516738	417681	Site of unnamed unlisted	Post-

				outfarm. Demolished C19.	medieval
87	MLS25016	514815	418229	Site of unnamed outfarm. Demolished C19.	Post-medieval
88	MLS22322	514495	417305	Site of a smithy on the corner of Town Street and St Crispins' Close.	Post-medieval
89	MLS21101	516849	416980	Cropmark, visible on an aerial photograph. Apparently a post medieval boundary.	Post-medieval
90	MLS20135	514991	419511	Hedgerow boundary between East Halton and North Killingholme parishes, formerly known as Meergate Hedge.	Post-medieval
91	MLS20569	516116	418737	Historically important hedgerows.	Post-medieval
92	MLS20570	517131	417262	Historically important hedgerows.	Post-medieval
93	MLS21326	514810	416964	The Humber Commercial Railway was constructed in 1912 to link the eastern jetty at Immingham Dock with the main Grimsby - New Holland line at Ulceby.	Modern
94	MLS21323	517443	417374	Marsh Row, A row of terraced houses was built on the south side of Marsh Lane in the early C20. They had been demolished by 1975.	Modern
95	MLS22498	517226	416910	Site of a Day School and associated school house shown on the 1945 OS map.	Modern
96	MLS22497	517166	417028	Site of a mission room shown on the 1945 OS map.	Modern
97	MLS22499	517156	417041	Site of a house called Myrtle Villas shown on the 1945 OS map.	Modern
98	MLS26104	517013	417149	Site of building shown on the 1945 OS map. Identified	Modern

				as chapel by local resident.	
99	MLS21227	516216	418621	The general location of a barrage balloon anchorage, operated by 942 Squadron Balloon Command during WW II. Exact site unknown.	Modern
100	MLS21229	515358	418618	General location of a barrage balloon anchorage, operated by 942 Squadron Balloon Command during WW II. Exact site unknown.	Modern
101	MLS21230	514396	418784	Location of a barrage balloon anchorage, operated by 942 Squadron Balloon Command during WW II. The balloon	Modern
102	MLS21231	515344	419701	A barrage balloon site, operated by 942 Squadron Balloon Command, was located at Chase Hill Farm. The site is now beneath the gas-fired power station.	Modern
103	MLS25901	514421	417833	The site of a WWII Women's Auxiliary Air Force dispersed site.	Modern
104	MLS22598	514519	418098	Site No 6, a dispersed group of barracks, associated with RAF North Killingholme.	Modern
105	MLS22594	515042	417578	Site No 4, a former WWII RAF dispersed site west of Eastfield Road.	Modern
106	MLS22595	514950	417777	Site No 5, a former WWII RAF dispersed site west of Eastfield Road.	Modern
107	MLS22596	514627	417546	Dispersed Site No 1 was associated with RAF North Killingholme.	Modern
108	MLS22597	514511	418366	Site No 2, a WWII RAF dispersed military camp north of Chase Hill Road.	Modern
109	MLS22805	514244	418300	Site No 3, a dispersed camp associated with RAF	Modern

				Killingholme.	
110	MLS21416	515500	419000	Site of WWII heavy anti aircraft battery.	Modern
111	MLS21417	515300	417300	Site of WWII heavy anti aircraft battery designated Humber H23.	Modern
112	MLS25899	514260	417675	The remains of a Second World War military communal site, east of East Halton Road.	Modern
113	MLS26150	517408	417544	An extensive series of Second World War anti landing obstacles.	Modern
114	MLS21322	517387	417040	A T-shaped arrangement of ditches is visible on wartime air photographs, north of Humber Road. They were dug as aircraft landing obstructions, and were mostly levelled at some time after the war.	Modern
115	MLS26149	517222	417381	Site of a Second World War bomb crater.	Modern
116	MLS26155	516809	418140	Site of two Second World War bomb craters.	Modern
117	MLS26156	516835	418222	Site of a Second World War bomb crater.	Modern
118	MLS26157	516879	418239	Site of a Second World War bomb crater.	Modern
119	MLS26158	516422	418399	Site of a Second World War bomb crater.	Modern
120	MLS26191	515946	419463	A near-circular hollow most likely the site of WWII bomb crater.	Modern
121	MLS22600	514319	417457	The site of a Second World War military mess site.	Modern
122	MLS20083	514309	418561	Site of the RAF Killingholme Sick Quarters.	Modern
123	MLS26747	515559	419682	A shallow concrete basin believed to be of military	Modern

				construction of WWII.	
124	MLS21706	514489	417341	A stone commemorating those who fell in the First and Second World Wars is located in St Denys' churchyard.	Modern
125	MLS21703	514202	418467	The lych gate to St Peter's church incorporates two plaques that commemorate the war dead of the parish.	Modern
126	MLS20103	516742	417545	Linear anomaly, west of Rosper Road, recorded by geophysical survey, 2000. Identified as a modern services trench during evaluations in 2006.	Modern
127	MLS20078	516128	416705	Former cropmark enclosure, now beneath oil refinery.	Uncertain
128	MLS26173	516152	419380	A linear bank and ditched feature is visible as cropmarks on aerial photographs. The feature is considered to be a flood defence earthwork or drainage feature.	Uncertain
129	MLS17838	514970	418750	Square enclosure, detected by a geophysical survey in 1989, north of Chase Hill Road.	Uncertain
130	MLS20789	517376	417818	Cropmark, visible on an aerial photograph. A possible enclosure with a double ditched trackway to the east. A geophysical on the site in 2011 detected neither feature.	Uncertain
131	MLS17840	515027	419075	Possible round house, barrow or modern feature.	Uncertain
132	MLS20431	515570	419546	A series of pit-type magnetic responses, detected during a geophysical survey in 2006.	Uncertain
133	MLS11775	515461	418828	Rectangular feature (former cropmark), north of Chase	Uncertain

				Hill Road.	
134	MLS21321	516835	417030	A small square enclosure of unknown date was visible as a cropmark on air photographs taken in 2001. It is now masked by the Immingham CHP plant.	Uncertain
135	MLS26758	516950	418209	An undated 2m wide, steep sided ditch cut.	Uncertain
136	MLS21348	516108	418668	A linear bank of uncertain date and function.	Uncertain
137	MLS20092	515495	419730	Linear ditches, located by geophysical survey in 1999.	Uncertain
138	MLS20139	516060	419400	Three linear ditches detected by geophysical survey in 2003. No archaeology was found during an eval in 2005.	Uncertain
139	MLS20146	515016	419263	A small group of geophysical anomalies.	Uncertain
140	MLS20148	516087	419058	Curvilinear and area anomalies identified during geophysical survey in 2004.	Uncertain
141	MLS20094	516060	418834	Linear ditches and pits, detected by geophysical survey in 1999.	Uncertain
142	MLS20141	517176	417841	Deposits interpreted as the buried shoreline were recorded during archaeological evaluations in 2004 and 2005.	Uncertain
143	MLS4635	516426	417698	`Cropmark site', east of Lindsey oil refinery. Linear and enclosure-like features, possibly non archaeological.	Uncertain
144	MLS21315	517143	416858	An L-shaped magnetic anomaly was identified by a geophysical survey in 2009. Trial trenching in 2010 revealed only natural deposits.	Uncertain

APPENDIX C
EXPANDED FLOOD RISK SCOPING CHAPTER

C1 Flood Risk and Surface Water Management

C1.1 Introduction

C1.1.1 This section presents information related to the scope of planned assessment with regard to the Proposed Development and flood risk. A detailed Flood Risk Assessment (FRA) will be prepared for the Proposed Development, considering flood risk from all sources, including allowance for climate change. The FRA will also include assessment of the potential effect of the Proposed Development on flood risk elsewhere. Whilst the main development Site would be located entirely within Flood Zone 1, the indicative eastern pipeline routes extends across Flood Zones 1, 2 and 3, requiring assessment of tidal flood risk along that indicative route.

C1.2 Legislation and Policy

C1.2.1 National policy regarding development and flood risk is set out in the National Planning Policy Framework (NPPF)[2] and accompanying Planning Practice Guidance (PPG)[3]. The overriding aim of national policy is to direct new development to areas at lowest risk of flooding through the application of a sequential approach to development planning. Development acceptability is determined by reference to both the development type and the flood hazard at the development Site. Development suitability in respective fluvial/tidal flood zones is summarised in PPG Table 2, a copy of which is presented below.

Table C1-1 Copy of Flood risk vulnerability and flood zone 'compatibility'

	Flood Risk Vulnerability Classification				
Flood Zones	**Essential Infrastructure**	**Highly Vulnerable**	**More Vulnerable**	**Less Vulnerable**	**Water Compatible**
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test Required	✓	✓	✓
Zone 3a†	Exception Test Required†	×	Exception Test Required	✓	✓
Zone 3b*	Exception Test Required*	×	×	×	✓*
✓ Development is appropriate; × Development should not be permitted.					

[2] **Department for Levelling Up, Housing and Communities**. National Planning Policy Framework. 2023. https://assets.publishing.service.gov.uk/media/669a25e9a3c2a28abb50d2b4/NPPF_December_2023.pdf

[3] **Department for Levelling Up, Housing and Communities**. PPG - Flood Risk and Coastal change. 2022. https://www.gov.uk/guidance/flood-risk-and-coastal-change

C1.2.2 It will be assumed that the Proposed Development would be classified as 'essential infrastructure'. Reference to PPG Table 2 indicates that essential infrastructure is appropriate development in Flood Zone 1 and 2. Essential infrastructure is considered to be appropriate development in Flood Zone 3, subject to passing the Exception Test.

C1.2.3 The sequential approach to development planning in flood risk areas is implemented through application of the Sequential Test and the Exception Test, as required. The Sequential Test aims to demonstrate that, when compared to alternative available and suitable locations, the selected development site is located in the area at lowest risk of flooding. PPG provides guidance on the implementation of the Sequential Test in low risk flood zones as follows.

"The Sequential Test should be applied to 'Major' and 'Non-major development' proposed in areas at risk of flooding, but it will not be required where:

- The site has been allocated for development and subject to the test at the plan making stage (provided the proposed development is consistent with the use for which the site was allocated and provided there have been no significant changes to the known level of flood risk to the site, now or in the future which would have affected the outcome of the test).
- The site is in an area at low risk from all sources of flooding, unless the Strategic Flood Risk Assessment, or other information, indicates there may be a risk of flooding in the future.
- The application is for a development type that is exempt from the test, as specified in footnote [60] of the National Planning Policy Framework".

C1.2.4 Whilst the Sequential Test relates to development type and location, the Exception Test is intended as a means to demonstrate that a development can be safely established with respect to national and local standards for flood protection. The Exception Test also includes a requirement to demonstrate that proposed development would provide the local community with sustainability benefits that would outweigh flood risk. As indicated in PPG guidance, the Exception Test does not need to be applied to development in Flood Zone 1.

C1.2.5 Planning policy regarding development and flood risk in the area is detailed in the North and North East Lincolnshire Strategic Flood Risk Assessment (NNEL SFRA)[4] which informs the Local Development Framework (LDF) and was published in June 2022.

C1.2.6 The NNEL SFRA restates the key principles of the NPPF with a commitment to direct new development to locations at lowest flood risk. The SFRA also provides information on tidal flood levels and flood hazards that could result from a breach of coastal defences. Both the Environment Agency flood zone maps and the NNEL SFRA ignore the presence of existing flood defences when defining the potential extent of flooding and the boundaries of respective flood zones. Whilst Environment Agency flood maps are based on present day conditions, the flood

[4] **NLC, NELC**. North East Lincolnshire Strategic Flood Risk Assessment. 2022. https://www.nelincs.gov.uk/assets/uploads/2022/09/202206-SFRA.pdf

maps in the NNEL SFRA take account of climate change effects by referencing breach flood levels and extents for the year 2115.

C1.2.7 The NNEL SFRA provides more detailed local guidance on the application of the Sequential Test as follows:

"The Sequential Test is required to explain why development proposed for a site where there is a risk of flooding cannot take place elsewhere, and so ensure that sites where there is little or no probability of a flood occurring (i.e. in Flood Zone 1) are developed in preference to sites where there is a medium or high probability (in Flood Zones 2 or 3). A Sequential Test is therefore normally required where development is proposed in Flood Zones 2 or 3, or where the SFRA or other evidence indicates there may be flooding issues now or in the future. In the case of North and North East Lincolnshire, the Environment Agency tidal hazard mapping should be referred to for sites in the relevant areas, with the test being required for sites shown to be at risk in the future in case of a breach in the defence".

C1.2.8 Reference to NLC flood mapping and Environment Agency tidal breach flood hazard mapping indicates that to 2115 the Proposed Development area, excluding the proposed pipeline route, would remain within Flood Zone 1 at low risk of tidal flooding.

C1.2.9 Environment Agency flood zone maps do not separate Flood Zone 3 into Flood Zone 3a and Flood Zone 3b (the functional floodplain). The NNEL SFRA does include differentiation between 3a and 3b. The NNEL SFRA flood maps for the Proposed Development Site reconfirms that entire Site is not within the functional floodplain.

C1.2.10 Local planning policy regarding development and flood risk is set out in both the Local Flood Risk Management Strategy [5] and the Local Development Framework Core Strategy (Adopted June 2011)[6]. Flood risk policy guidance is provided in the LDF Core Strategy at Policy CS19 in relation to a sequential approach to development planning and the requirement to adopt sustainable approaches to surface water drainage, as follows:

"CS19: FLOOD RISK

The council will support development proposals that avoid areas of current or future flood risk, and which do not increase the risk of flooding elsewhere. This will involve a risk based sequential approach to determine the suitability of land for development that uses the principle of locating development, where possible, on land that has a lower flood risk, and relates land use to its vulnerability to flood. Development in areas of high flood risk will only be permitted where it meets the following prerequisites:

- It can be demonstrated that the development provides wider sustainability benefits to the community and the area that outweigh flood risk.

[5] **North Lincolnshire Council.** Local Flood Risk Management Strategy. 2016. https://www.northlincs.gov.uk/wp-content/uploads/2018/07/Local-Flood-Risk-Management-Strategy.pdf

[6] **North Lincolnshire Council.** North Lincolnshire Local Development Framework Core Strategy adopted June 2011. 2011. https://m.northlincs.gov.uk/public/planningreports/corestratergy/adopteddpd/FullCoreStrategy.pdf

- The development should be on previously used land. If not, there must be no reasonable alternative developable sites on previously developed land.
- A flood risk assessment has demonstrated that the development will be safe, without increasing flood risk elsewhere by integrating water management methods into development.

Development proposals in flood risk areas which come forward in the remainder of North Lincolnshire shall be guided by the Strategic Flood Risk Assessment for North Lincolnshire and North East Lincolnshire. This will ensure that proposals include site specific flood risk assessments which take into account strategic flood management objectives and properly apply the Sequential and, where necessary, Exception Tests.

In addition development will be required, wherever practicable, to incorporate Sustainable Urban Drainage Systems (SUDS) to manage surface water drainage. The Council will also seek to reduce the increase in flood risk due to climate change through measures to reduce carbon dioxide emissions".

C1.2.11 NLC is currently in the process of preparing a new Local Plan. The plan is currently at Stage 6 submission and examination with adoption, Stage 7 scheduled for 2025. At present the new draft Local Plan is of limited weight with respect to the planning process

C1.2.12 NLC published additional guidance on development and flood risk in 2013. The Development and Flood Risk Guidance Note [7](April 2013) provides further detail on the application of the Sequential Test within North Lincolnshire and sets out guidance on approaches to demonstrating safe development.

C1.2.13 The SFRA provides basic information on the requirement for use of sustainable drainage systems (SuDS) at all new development, where possible. The LFRMS provides a general statement on the planning approach to SuDS as follows:

"Planning System Provide SuDS/drainage input to all relevant planning applications under our role as statutory consultee with respect to SuDS, to ensure that appropriate surface water runoff management is incorporated in new builds/refurbishments. Provide information to the North Lincolnshire Council spatial planning department and developers, such as advice to avoid development of locations that convey/store surface water to ensure that such flow routes are not interrupted. Assist in preparing a calculation to secure SuDS developer contributions through the Section 106 process to provided management and maintenance of any new SuDS infrastructure adopted as part of a new development".

C1.2.14 Further national guidance related to the objectives and design of SuDS systems is provided in Defra's 'Non-statutory technical standards for sustainable drainage systems'[8]. Guidance on the

[7] **North Lincolnshire Council**. Development and Flood Risk Guidance Note - April 2013. 2013. https://www.northlincs.gov.uk/wp-content/uploads/2022/02/Development-and-Flood-Risk-Guidance-Note-April-2013-a.pdf

[8] **DEFRA**. Non-statutory technical standards for sustainable drainage systems/ 2015/ https://assets.publishing.service.gov.uk/media/5a815646ed915d74e6231b43/sustainable-drainage-technical-standards.pdf

application of climate change allowances in flood risk assessments is provided in Environment Agency guidance 'Flood risk assessments: climate change allowances'[9].

C1.3 Baseline Conditions

C1.3.1 The Site is located in the surface water catchment of a local drain (Haven Road Drain) that discharges directly to the Humber Estuary. The proposed pipeline route crosses multiple small drainage channels. In the north, the drainage channels discharge to Haven Road Drain. Haven Road Drain receives surface water from the industrial areas to the west and south of the Site and discharges to the Estuary at North Killingholme Haven 1.5km to the north east. Flood Estimation Handbook (FEH) catchment models indicate that at the downstream Site boundary the drain receives surface water drainage from a catchment area of 1.1km^2 with a catchment average annual rainfall of 620mm and a standard percentage runoff of 42%, reflecting to urbanised nature of the catchment and the relatively low infiltration capacity of surfaces. The central and southern end of the proposed pipeline route extends across drainage channels that discharge to Humber Road Drain which flows eastwards to outfall at the Humber Estuary.

C1.3.2 Surface water drainage features within the former operational areas of the Site are man-made drainage systems that form part of the Site surface water management provision. Surface water drainage is directed to on-Site stormwater attenuation ponds prior to off-Site discharge to the Humber Estuary. Drainage of land within the Site boundary but outside the former operational areas of the Site is achieved by field drainage systems that drain either to the surface water drain along Chase Hill Road in the south or the open drainage channel around the former power station Site to the north.

C1.3.3 The Site is located in close proximity to the Humber Estuary and tidal flood hazard is therefore a key consideration. Tidal flood risk is likely to be the dominant form of flood risk. As there are no major surface watercourses in the vicinity of the Site, tidal flood risk is the primary consideration.

C1.3.4 Tidal flooding can occur as a consequence of high tide level or wave overtopping. The Site is located too far from the coast to be vulnerable to wave overtopping and therefore flood risk is considered in relation to high tide. The Environment Agency publishes flood maps showing the potential extent of flooding from rivers and sea, excluding the effect of any flood defences. It is assumed that flood defences could fail and therefore flood risk is defined by the undefended flood condition. The Environment Agency also publish flood maps that show the potential extent of fluvial and coastal flooding including the effect of any flood defences present. This 'defended' mapping indicates actual flood risk with current standards of protection.

[9] **EA**. Flood risk assessments: climate change allowances. 2022. https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#full-publication-update-history

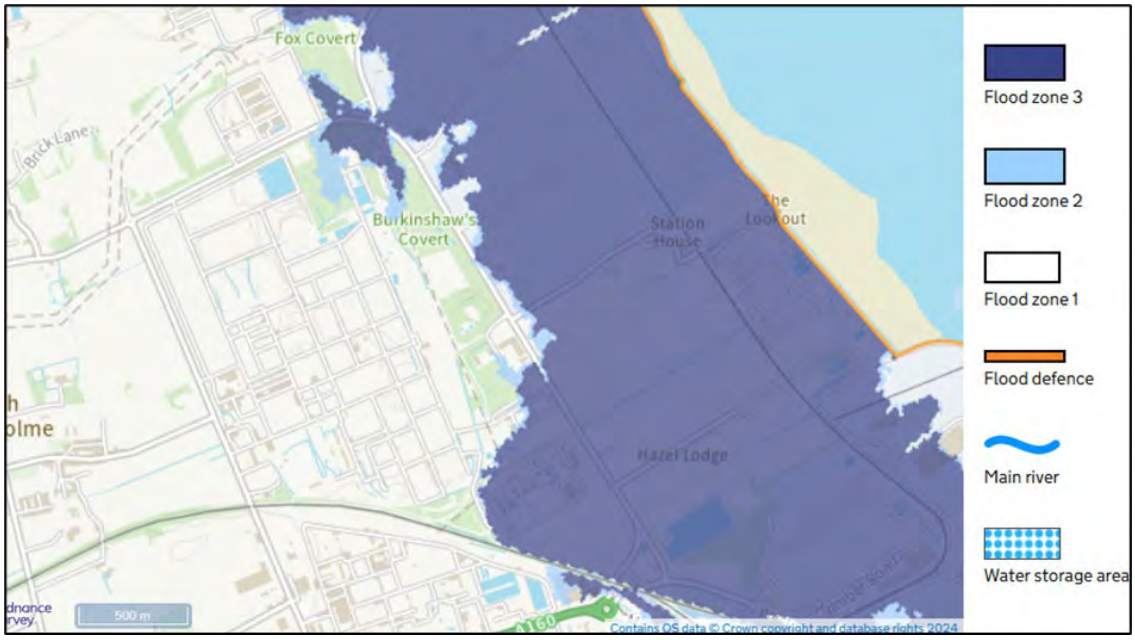


Figure C1-1 Environment Agency Flood map for planning extract © Environment Agency

C1.3.5 The current Environment Agency undefended flood map for the Site and surrounding area is presented as Figure C1-1. The Site area is designated Flood Zone 1 and therefore at low risk of tidal flooding. The probability of flooding in Flood Zone 1 is defined as less than 0.1% or less than 1 in 1,000 years. The southern section of the pipeline route extends across Flood Zone 2 and 3. Reference to Figure C1-1 indicates that land further east, and along the estuary frontage at North Killingholme Haven, is also designated Flood Zone 3 and is therefore considered to be at high risk of tidal flooding i.e. a flood risk probability of greater than 0.5%AEP. Tidal flood risk in the area is directly related to ground level with lower lying land at greatest risk of tidal flooding.

C1.3.6 Surface water flood risk is defined in relation to direct rainfall over the Site and the capacity of Site surfaces and drainage systems to accommodate it. Environment Agency surface water flood risk maps are defined through application of a specific procedure based on digital terrain models and assumptions regarding losses to infiltration and/or urban drainage. An extract from the Environment Agency surface water flood risk map for the Site is included as Figure 5.3-2. The map demonstrates that localised areas of the Site are considered to be at low to high risk of surface water flooding. Ground level data for the Site confirms that such areas are topographic low points within which surface water could accumulate if not adequately drained.

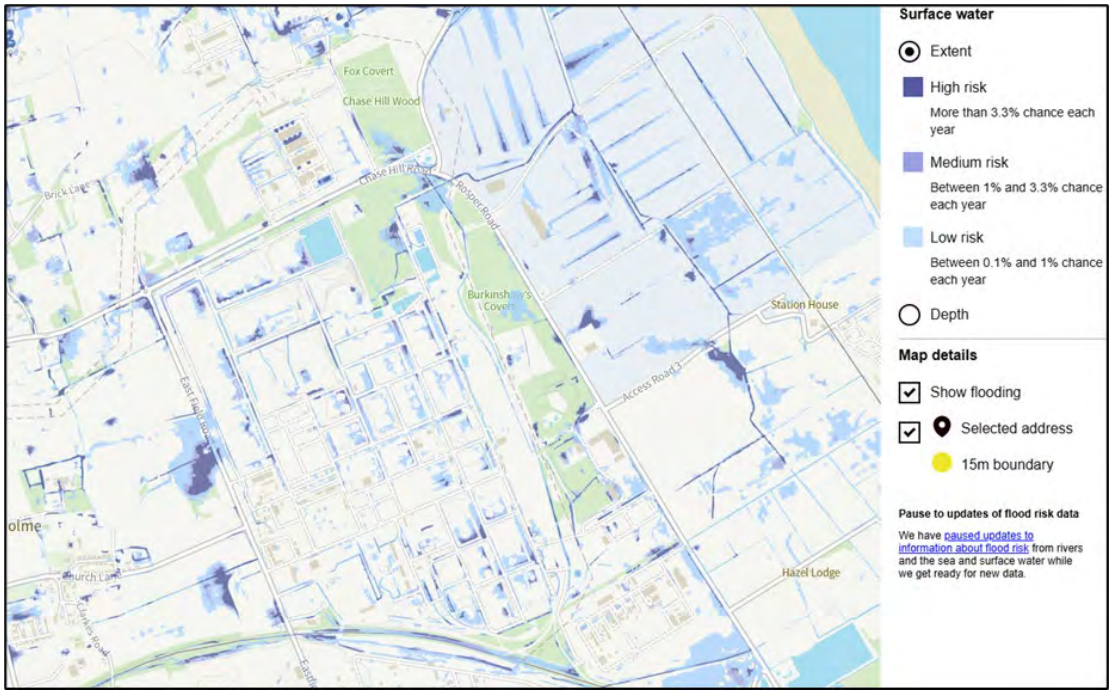


Figure C1-2 Environment Agency surface water flood risk map extract © Environment Agency

C1.3.7 British Geological Survey (BGS) mapping indicates that the Site is underlain by the Burnham Chalk Formation which extends beneath the Site and the surrounding area. The chalk bedrock is overlain by low permeability Till deposits consisting of a variable mixture of clay, silt and sand. The Chalk bedrock is a Principal Aquifer with high water storage potential. However, at this coastal location, chalk groundwater levels are expected to be close to sea level and therefore several metres below ground level at the Site. The overlying Till deposits have no significant potential for storage or transmission of groundwater due to significant lateral permeability variation. As elevated groundwater levels in the chalk are unlikely to result from temporary increase in sea level during tidal flooding, the primary mechanism for variation in groundwater level is the response to rainfall recharge. As the majority of the Site is covered with low permeability surfacing, and as low permeability Till is present beneath the Site, recharge to the underlying chalk aquifer is likely to be highly restricted with no significant potential for increase in groundwater level to surface elevation. As a consequence, the Site is considered to be at low risk of flooding from groundwater.

C1.3.8 The Site is situated in an urban location and therefore the FRA will incorporate evaluation of flood risk associated with inadequate capacity or failure of local drainage infrastructure.

C1.4 Receptors

C1.4.1 The Proposed Development would have no effect on tidal flood extents or depth and would not result in any loss of floodplain storage. Potential receptors of any change in flood risk due to an increase in off-Site discharge of surface water or change in the hydrological characteristics of

local drainage channels would be adjacent commercial and industrial development and land west of Rosper Road.

C1.5 Potential Effects

Construction Phase

C1.5.1 If inadequately controlled, surface water drainage from the Site could lead to an increase in downstream flood risk along Haven Road. If inappropriately designed and constructed, pipeline watercourse crossings could change the current hydrological functioning of the local drainage system, including Rosper Road Pools Nature Reserve.

Operational Phase

C1.5.2 If inadequately controlled, surface water drainage from the Site could lead to an increase in downstream flood risk along Haven Road. If inappropriately designed and constructed, pipeline watercourse crossings could change the current hydrological functioning of the local drainage system, including Rosper Road Pools Nature Reserve.

Table C1-2 EIA scoping justifications

Flood Risk	Effect	Scoped In or Out	Justification
Construction	Increased surface water flood risk	Scoped out	Effect can be fully mitigated by on-Site drainage design in accordance with national and local policy and guidance. Pipeline construction method to ensure no adverse impact on local drainage or flood risk.
Operation	Increased surface water flood risk	Scoped out	Effect can be fully mitigated by on-Site drainage design in accordance with national and local policy and guidance. Subsurface pipeline would have no adverse impact on local drainage or flood risk.

C1.6 Mitigation

Construction

C1.6.1 A comprehensive construction surface water management plan would be developed to establish on-Site drainage provision and stormwater attenuation capacity to prevent increase in the peak rate and volume of off-Site surface water discharge. The pipeline would be designed to ensure no

impact on fluvial flood flow capacity at any watercourse crossing at any stage of the construction process.

Operational

C1.6.2 The development-wide surface water drainage system would be designed in accordance with local drainage policy and Defra non-statutory technical standards to deliver a sustainable drainage system with adequate stormwater attenuation capacity to prevent increase in the peak rate and volume of off-Site surface water discharge.

C1.7 Proposed Assessment Methodologies

Baseline Assessment

C1.7.1 The baseline assessment will incorporate evaluation of potential flood risk to the Proposed Development from all sources, including tidal flooding, surface water flooding, groundwater flooding and flooding from failure of drainage infrastructure. A detailed review of existing Site surface water drainage systems would be undertaken to establish hydrological and hydraulic characterisation of key drainage systems and the design basis of existing stormwater attenuation facilities.

C1.7.2 Flood risk assessment will be based on reference to published flood data provided by the Environment Agency and NLC as necessary. The assessment will be supported by a detailed Site-wide hydrological survey, including the proposed pipeline route.

C1.7.3 Surface water drainage assessment will be undertaken by reference to rainfall data derived from FEH rainfall models and application of rainfall-runoff analytical methodologies that may include FEH rainfall-runoff modelling, IH124 methodology and reference to SuDS technologies in The SuDS Manual and other relevant best-practice reference sources.

Guidance

- NNEL SFRA
- NLC Development and Flood Risk Guidance Note
- EA Flood Risk Standing Advice[10]
- Defra Non-statutory standards for sustainable drainage (2015)
- EA Flood risk assessments: climate change allowances (2022)

[10] **EA**. Preparing a Flood Risk Assessment: Standing Advice. 2024. https://www.gov.uk/guidance/flood-risk-assessment-standing-advice

- Ciria SuDS Manual[11]

Consultation

C1.7.4 It may be necessary to consult with the Environment Agency and Lincolnshire County Council in its capacity as Lead Local Flood Authority (LLFA) for Lincolnshire.

Scope and Methodology

C1.7.5 The general scope for flood risk assessments at Sites in Flood Zone 1 is defined in the NPPF, the local authority SFRA and current Environment Agency standing advice. Although Sites in Flood Zone 1 are considered to be a low risk of fluvial flooding it is necessary to establish that there is no risk of flooding from other sources and that surface water management at the Site itself will not result in increased flood risk elsewhere. The main focus of a Flood Zone 1 risk assessment is therefore demonstrating that surface water can be effectively managed without adverse impact at the Site or in the surrounding area. Current National Standards for Sustainable Drainage Systems[12] require that, where reasonably practicable, all new developments are to be equipped with sustainable drainage systems (SuDS) that are approved by the LLFA.

C1.7.6 Preparation of a Flood Risk Assessment that is detailed enough to meet current regulatory requirements will need to incorporate the following stages:

- Assessment of flood risk from non-fluvial sources;
- Hydrological analysis to establish runoff rates for a range of storm durations and frequency up to and including the 1:1000 year event including climate change allowance;
- Assessment of existing drainage capacity and any requirement for stormwater attenuation or management on-Site;
- Definition of any required flood protection or management measures i.e. development levels, access arrangements etc.;
- Demonstration that surface water management provisions would not increase flood risk to surrounding properties.

[11] **B. Woods Ballard, et al**,. The SuDS Manual. CIRIA. 2015

[12] **DEFRA**, National Standards for sustainable drainage systems, 2011, https://assets.publishing.service.gov.uk/media/5a79d1a240f0b66d161ae5d2/suds-consult-annexa-national-standards-111221.pdf

C1.7.7 Once constructed, the proposed pipeline is not expected to have any adverse impact on local drainage or flood risk. However, assessment of tidal flood extents, levels and hazard would be undertaken for sections of the pipeline route that would extend through Flood Zones 2 and 3.

C1.7.8 A Site survey will be undertaken to confirm the location and configuration of any existing surface water drainage features at the Site and in the surrounding area, including the final selected pipeline route.

C1.7.9 A drainage strategy for the proposed development will be prepared. It is assumed that, to comply with local and national policy, a SUDS based drainage strategy will be required and that there will be a need to ensure that post development runoff is restricted to current rates. The strategy will incorporate outline hydraulic calculations incorporating:

- Calculation of greenfield rates
- Calculation of post development runoff for design storm events
- Identification of on-Site attenuation/storage requirements and options to manage surface water
- SuDS scheme design to the level of detail required at planning stage.

C1.7.10 The FRA will include consideration of flood risk and any management or mitigation requirements during both the construction and post-construction phases of the proposed development. The results of the assessment will be communicated in a NPPF compliant flood risk assessment and drainage strategy report with relevant drawings, tables and appendices as appropriate. The report will be suitable for submission to the LPA in support of the proposed planning application.

C1.8 Assessment Limitations and Assumptions

C1.8.1 Flood risk assessment will rely on flood hazard data provided by third parties i.e. Environment Agency and NLC

C1.9 Cumulative Effects and Health Effects

C1.9.1 As all potential flood risk effects would be managed and mitigated within the Site boundary there would be no contribution to cumulative effects and no potential health effects.

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