

South Humber Bank Energy Centre Development Consent Order

South Marsh Road, Stallingborough, DN41 8BZ

**Environmental Impact Assessment: Preliminary Environmental Information
Report - Volume I**

**The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017
(as amended)**



Applicant: EP Waste Management Limited
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GLOSSARY OF ABBREVIATIONS AND DEFINITIONS

Abbreviation	Description
ACC	Air Cooled Condenser
AGI	Above Ground Installation - installations used to support the safe and efficient operation of the pipeline; above ground installations are needed at the start and end of a cross-country pipeline and at intervals along the route.
AOD	Above Ordinance Datum - a spot height (an exact point on a map) with an elevation recorded beside it that represents its height above a given datum.
AQMA	Air Quality Management Area – an area designated by the local authority to be managed, to ensure that the area meets national air quality objectives.
BAT	Best Available Technique - the available techniques which are the best for preventing or minimising emissions and impacts on the environment. BAT is required for operations involving the installation of a facility that carries out industrial processes.
BGS	British Geological Survey - provider of objective and authoritative geoscientific data, information and knowledge for the UK.
CAA	Civil Aviation Authority - the UK's specialist aviation regulator.
CCGT	Combined Cycle Gas Turbine – an energy generation technology in which the exhaust heat from a gas turbine (Joule cycle) is used to raise steam and drive a steam turbine (Rankine cycle). Both turbines drive electrical generators to produce electricity. The combination of these cycles allows for a greater efficiency than either cycle operating in isolation.
CEMP	Construction Environmental Management Plan - a plan to outline how a construction project will avoid, minimise or mitigate effects on the environment and surrounding area.
CEMS	Continuous Emission Monitoring Systems - a tool to monitor flue gas for oxygen, carbon monoxide and carbon dioxide to provide information for combustion control in industrial settings.

CHP	Combined Heat and Power - a technology that puts to use the residual heat of the combustion process after generation of electricity that would otherwise be lost to the environment.
CIBSE	Chartered Institution of Building Services Engineers.
EIA	Environmental Impact Assessment – a term used for the assessment of environmental consequences (positive or negative) of a plan, policy, program or project prior to the decision to move forward with the proposed action.
EMS	Environment Management System - the management of an organisation's environmental programs in a comprehensive, systematic, planned and documented manner.
EPC	Engineering, Procurement and Construction.
EPUKI	EP UK Investments – The Applicant
ES	Environmental Statement - A report in which the process and results of an Environment Impact Assessment are documented.
FGT	Flue Gas Treatment - treatment of flue gases to reduce or eliminate toxic and noxious emissions from all combustion-related processes.
HGV	Heavy Goods Vehicle - vehicles with a gross weight in excess of 3.5 tonnes.
HSE	Health and Safety Executive.
IZ	Inner Zone – HSE consultation zone.
LPA	Local Planning Authority.
LWS	Local Wildlife Site - non-statutory sites of nature conservation value that have been designated 'locally'. These sites are referred to differently between counties with common terms including site of importance for nature conservation, county wildlife site, site of biological importance, site of local importance and sites of metropolitan importance.
MBT	Mechanical Biological Treatment - a generic term for a combination of mechanical equipment (similar to that used in a materials recycling facility to physically separate different materials fractions) and some biological treatment element (aerobic with air or anaerobic without air to biodegrade or biodry the organic fraction of the waste).
MMP	Materials Management Plan – a clear and auditable plan for bulk soil movements.
MRF	Materials Recovery Facility - uses mechanical pre-treatment so as to recover additional recyclables.
MW	Megawatts – unit of energy.
MZ	Middle Zone - HSE consultation zone.
NCA	National Character Area – England's major landscape areas.
NELC	North East Lincolnshire Council.
NELLCA	North East Lincolnshire Landscape Character Assessment.
NGET	National Grid Electrical Transmission – the organisation in charge of operating electricity transmission network.

NVZ	Nitrate Vulnerable Zone - areas designated as being at risk from agricultural nitrate pollution.
OS	Ordnance Survey - the national mapping agency for Great Britain.
OZ	Outer Zone - HSE consultation zone.
PEIR	Preliminary Environmental Information Report.
PINS	Planning Inspectorate.
RDF	Refuse Derived Fuel - is residual waste that has been processed to comply with the particular specifications of the end user regarding calorific value, moisture content, quantity and format.
SAC	Special Area of Conservation – high quality conservation sites that are protected under the European Union Habitats Directive, due to their contribution to conserving those habitat types that are considered to be most in need of conservation.
SCR	Selective Catalytic Reduction - a means of converting nitrogen oxides with the aid of a catalyst into diatomic nitrogen and water.
SHBPS	South Humber Bank Power Station.
SNCI	Site of Nature Conservation Importance - support both locally and nationally threatened wildlife, and many sites contain habitats and species that are priorities under the county or UK biodiversity action plans.
SNCR	Selective Non-Catalytic Reduction – a means of reducing nitrogen oxide emissions by injecting either ammonia or urea to convert nitrogen oxides into nitrogen, carbon dioxide and water.
SPA	Special Protection Area – strictly protected sites classified in accordance with Article 4 of the EC Birds Directive. Special Protection Areas are Natura sites which are internationally important sites for the protection of threatened habitats and species.
SSSI	Site of Special Scientific Interest - nationally designated Sites of Special Scientific Interest, an area designated for protection under the Wildlife and Countryside Act 1981 (as amended), due to its value as a wildlife and/or geological site.
ZTV	Zone of Theoretical Visibility - a computer generated tool to identify the likely (or theoretical) extent of visibility of a development.

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1.0 INTRODUCTION

1.1 Background

- 1.1.1 This Preliminary Environmental Information Report ('PEI Report') has been prepared on behalf of EP Waste Management Limited ('the Applicant') in relation to a proposed application ('the Application') to be made to the Secretary of State for Business, Energy and Industrial Strategy, seeking Development Consent for the construction of an energy from waste power station to be built on land located within the boundary of the South Humber Bank Power Station site, near Stallingborough, North East Lincolnshire.
- 1.1.2 The Proposed Development is located on a parcel of land to the east of the South Humber Bank Power Station, off South Marsh Road, Stallingborough.
- 1.1.3 This PEI Report presents:
- a description of the Proposed Development;
 - the likely significant environmental effects of its construction, operation and decommissioning based on the preliminary environmental information available at the time of writing;
 - measures to avoid or reduce such effects; and
 - the alternative sites, technologies and layouts considered.
- 1.1.4 The PEI Report is provided to support consultees in developing an informed view of the likely significant environmental effects of the Proposed Development.
- 1.1.5 All the land required for the Proposed Development (and included within the Application site boundary) is referred to in this PEI Report as 'the Site'. The Proposed Development is entirely within the administrative boundary of North East Lincolnshire Council ('NELC').
- 1.1.6 This chapter is supported by Figure 1.1, which illustrates the Site location.

1.2 The Applicant

- 1.2.1 EP Waste Management Limited (the Applicant), is a subsidiary of EP UK Investments Limited ('EPUKI'). EPUKI owns and operates a number of other power stations in the UK. These include South Humber Bank and Langage (Devon) gas-fired power stations and Lynemouth (Northumberland) biomass-fired power station and power generation assets in Northern Ireland. EPUKI also owns sites with consent for new power stations in Norfolk and North Yorkshire.

1.3 The Proposed Development

- 1.3.1 The Proposed Development is an energy from waste power station with a gross electrical output of up to 95 MW.
- 1.3.2 The Proposed Development will recover energy in the form of electricity and potentially heat (as steam or hot water) through the controlled combustion of Refuse Derived Fuel (RDF). RDF comprises processed waste from municipal/ household, commercial and industrial sources. The Environmental Permit required for the operation of the Proposed Development will include a specific list of types of waste that can be accepted.
- 1.3.3 Full planning permission for a 49.9 MW energy from waste power station at the Site was granted by NELC under the Town and Country Planning Act 1990 on 12th April 2019 (referred to as 'the Consented Development'). Since the grant of this planning

permission ('the Planning Permission') the Applicant has been assessing potential opportunities to improve the efficiency of the Consented Development and now proposes an energy from waste power station of up to 95 MW electrical output (the Proposed Development).

- 1.3.4 While the Proposed Development will require some additional works at the Site, the Applicant is not seeking any changes to the maximum building dimensions that were approved under the Planning Permission and which were assessed as part of the Environmental Impact Assessment (EIA) that formed part of the planning application submitted to NELC for the Consented Development.
- 1.3.5 The nominal design capacity of the Proposed Development is 616,500 tonnes per annum of RDF based on a design net calorific value (NCV) of 11 MJ/kg and the expected plant annual running hours. The plant is capable of maintaining the maximum electrical output while combusting fuel in a range of NCVs between 9 and 14 MJ/kg. The maximum fuel throughput of the Proposed Development is theoretically 753,500 tonnes per annum if only fuel with a NCV of 9 MJ/kg were to be used, based on the expected plant annual running hours. This is the same maximum fuel throughput as was assessed by the EIA for the Consented Development.
- 1.3.6 It is proposed that the facility will operate twenty-four hours a day, seven days a week, with occasional offline periods for maintenance.
- 1.3.7 RDF will be delivered by road, with deliveries taking place twenty-four hours a day, seven days a week, including Bank Holidays but excluding Christmas Day, Boxing Day and New Year's Day. The Proposed Development will include storage capacity for approximately four days of fuel in a fuel bunker, so that the plant can continue to operate if there are any short term fuel supply issues.
- 1.3.8 The Site area is approximately 25 hectares (ha). Most of the existing South Humber Bank Power Station site is included within the Site since it is within the control of the Applicant and allows the Applicant to optimise utility connections and areas for landscaping, mitigation and enhancement that may be required.
- 1.3.9 A full description of the Site is set out in Chapter 3: The Site of this PEI Report and the Proposed Development is described in more detail in Chapter 4: The Proposed Development of this PEI Report.

1.4 The Development Consent Process

- 1.4.1 With reference to the Planning Act 2008, the Proposed Development will comprise an 'onshore generating station' with a capacity of up to 95 MW gross electrical output and it therefore falls within the definition of a 'nationally significant infrastructure project' under Sections 14(1)(a) and 15(2) of the Planning Act 2008 as a 'generating station exceeding 50 MW'.
- 1.4.2 Development consent for the Proposed Development is therefore required from the Secretary of State (SoS) for Business, Energy and Industrial Strategy. This is granted in the form of a Development Consent Order (DCO). A DCO has the effect of granting consent for construction of a development in addition to a range of other consents and authorisations, as well as removing the need for some consents (such as planning permission).
- 1.4.3 An application for development consent is submitted to the Planning Inspectorate (PINS), acting on behalf of the SoS. Subject to an application being accepted, which will be determined within a period of 28 days following receipt of an application, PINS appoint an inspector (or panel of inspectors), known as the Examining Authority (ExA), to examine the application. The examination must be completed within six months,

following which the ExA has three months to write a report providing a recommendation to the SoS whether to grant development consent. Finally, the SoS has three months to make a final decision on whether to grant development consent.

1.5 Environmental Impact Assessment (EIA) and the Purpose of the Preliminary Environmental Information (PEI) Report

1.5.1 The Applicant has notified the Secretary of State in writing under Regulation 8(1)(b) of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) (the 'EIA Regulations') that it intends to provide an Environmental Statement (ES) in respect of the Proposed Development. The Proposed Development is therefore 'EIA development' for the purposes of the EIA Regulations and an ES will form part of the Proposed Application.

1.5.2 Following the completion of an EIA Scoping Report and publication of PINS' Scoping Opinion, the EIA for a DCO is reported in two stages:

1. the PEI Report is prepared to inform consultation with the public and other stakeholders about the Proposed Development, based on the preliminary environmental information available at the time of consultation; and
2. the ES is prepared to accompany the Application.

The EIA Scoping Process

1.5.3 The purpose of the EIA Scoping process is to determine which topics should be included in the EIA, and the level of detail to which they should be assessed. An EIA Scoping Report and a request for an EIA Scoping Opinion pursuant to Regulation 10 of the EIA Regulations was submitted to PINS on 21st August 2019.

1.5.4 The EIA Scoping Report (see Appendix 1A in PEI Report Volume III) was developed with reference to standard guidance and best practice and was informed by the EIA team's experience working on a number of other similar projects, including the EIA for the Consented Development, which was completed in December 2018.

1.5.5 The EIA Scoping Report set out:

- details of the Proposed Development (including comparison with the Consented Development) and the Site;
- a summary of alternatives considered;
- a summary of existing and future baseline conditions;
- an outline of the likely environmental effects of the Proposed Development;
- a description of the matters to be scoped in and out of the EIA;
- proposed assessment methods; and
- the proposed structure of the ES.

1.5.6 PINS' Scoping Opinion was received on 4th October 2019 and is presented within Appendix 1B in PEI Report Volume III. The matters raised have been reviewed and are being taken into consideration in the relevant technical assessments. Further details on the EIA Scoping Opinion are set out in Chapter 2: Assessment Methodology.

The PEI Report

1.5.7 This PEI Report has been prepared to satisfy the requirements of Regulation 12(2) of the EIA Regulations. In accordance with Regulation 12(2)(b), the PEI Report presents *"the information referred to in Regulation 14(2) which... is reasonably required for the*

consultation bodies to develop an informed view of the likely significant environmental effects of the development (and of any associated development)". Regulation 14(2) describes the requirements of an ES.

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

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

SPECIFIED INFORMATION	LOCATION WITHIN PEI REPORT
a) a description of the proposed development comprising information on the site, design, size and other relevant features of the development;	Volume I Chapter 3: Description of the Proposed Development Site, Chapter 4: The Proposed Development, Chapter 5: Construction Programme and Management, and Chapter 6: Need, Alternatives and Design Evolution, and supporting figures and appendices to these chapters in Volumes II and III
b) a description of the likely significant effects of the proposed development on the environment;	Volume I Chapters 7 to 16, 'Likely Impacts and Effects' sections
c) a description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;	Volume I Chapter 4: The Proposed Development and Chapters 7 to 16, 'Development Design and Impact Avoidance' and 'Mitigation and Enhancement Measures' sections
d) a description of the reasonable alternatives studied by the applicant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment;	Volume I Chapter 6: Need, Alternatives and Design Evolution
e) a non-technical summary of the information referred to in subparagraphs (a) to (d); and	Non-Technical Summary

SPECIFIED INFORMATION	LOCATION WITHIN PEI REPORT
f) any additional information specified in Schedule 4 relevant to the specific characteristics of the particular development or type of development and to the environmental features likely to be significantly affected.	<p>Baseline conditions relevant to each assessment are described in Volume I Chapters 7 to 16, 'Baseline Conditions' sections</p> <p>Assessment methods are described in Volume I Chapter 2: Assessment Methodology and Chapters 7 to 16, 'Assessment Methodology and Significance Criteria' sections</p> <p>Any limitations and/or difficulties with the assessments are described in Volume I Chapters 7 to 16, 'Limitations or Difficulties' sections</p> <p>As planning permission has previously been granted for a 49.9 MW energy from waste power station on the Site (the Consented Development), the assessments also include a comparison of the effects of the Proposed Development with the effects of the Consented Development to provide relevant context.</p>

- 1.5.9 PINS Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements (PINS, 2017) notes *"A good PEI document is one that enables consultees (both specialist and non-specialist) to understand the likely environmental effects of the Proposed Development and helps to inform their consultation responses on the Proposed Development during the pre-application stage."*
- 1.5.10 In order to enable consultees to understand the likely environmental effects of the Proposed Development, this PEI Report presents preliminary findings of the environmental assessments undertaken to date. This allows consultees the opportunity to provide informed comment on the Proposed Development, the assessment process and preliminary findings prior to the finalisation of the DCO application and the Environmental Statement (ES). The Applicant is seeking the views of consultees on the information contained within this report, and there is opportunity within the process up to submission of the DCO application for both the EIA and the project design to have regard to comments received.
- 1.5.11 It should be noted that this PEI Report does not constitute a full ES, but rather presents the findings of the EIA process to date. The information presented in this PEI Report describes the current extent of the environmental assessment work undertaken based upon the information available. The various assessments are at differing stages of completion, although due to the way the Proposed Development has evolved from the Consented Development, for which a comprehensive EIA was undertaken, many aspects of the assessments have already been completed. It is considered that the PEI Report presents sufficient preliminary environmental information to enable consultees to develop an informed view of the Proposed Development.

1.5.12 Following statutory consultation on the preliminary environmental information this PEI Report will be developed into a final ES taking into consideration comments raised during the consultation. The ES will be submitted as part of the suite of DCO application materials.

1.6 Structure of this PEI Report

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

1.6.2 Volume I of the PEI Report is structured into chapters, as follows:

- Chapters 1 and 2 – an introduction to the PEI Report and EIA approach;
- Chapters 3 to 6 – a description of the Site and Proposed Development including information on construction timescales and alternatives;
- Chapters 7 to 16 – preliminary assessments of the likely significant effects of the Proposed Development (including comparison to the Consented Development) in relation to the environmental topics scoped in to the EIA;
- Chapter 17 – preliminary assessment of potential inter-relationships between the topics covered in Chapters 7 to 16 (combined effects), and between the Proposed Development and other planned developments in the surrounding area (cumulative effects); and
- Chapter 18 – a summary of the preliminary assessment of likely significant environmental effects.

1.6.3 Volumes II and III of the PEI Report comprise the figures and technical appendices that accompany each chapter of Volume I.

1.6.4 A separate document has also been prepared to provide a non-technical summary (NTS) of this PEI Report.

1.7 Consultation

1.7.1 Consultation is integral to the preparation of DCO applications and to the EIA process. The views of consultation bodies and the local community serve to focus the environmental studies and to identify specific issues that require further investigation, as well as to inform aspects of the design of the Proposed Development. Consultation is an on-going process and the publication of this PEI forms an important part of that process.

1.7.2 The Planning Act 2008 (the PA 2008) requires applicants for development consent to carry out formal (statutory) pre-application consultation on their proposals. There are a number of requirements as to how this consultation must be undertaken that are set out in the PA 2008 and related regulations:

- Section 42 of the PA 2008 requires the applicant to consult with ‘prescribed persons’, which includes certain consultation bodies such as the Environment Agency and Natural England, relevant statutory undertakers, relevant local authorities, those with an interest in the land, as well as those who may be affected by the development;
- Section 47 of the PA 2008 requires the applicant to consult with the local community on the development. Prior to this, the applicant must agree a Statement of Community Consultation (SoCC) with the relevant local authorities. The SoCC must set out the proposed community consultation and, once agreed with the relevant local authorities, a SoCC Notice must be published in local

newspapers circulating within the vicinity of the land in question providing details of how the SoCC can be inspected. The consultation must then be carried out in accordance with the final SoCC;

- Section 48 of the PA 2008 places a duty on the applicant to publicise the proposed application in the 'prescribed manner' in a national newspaper, The London Gazette and a local newspaper circulating within the vicinity of the land in question; and
- Section 49 places a duty on the applicant to take account of any relevant responses received to the consultation and publicity that is required by Sections 42, 47 and 48.

1.7.3 The Applicant informally consulted NELC and PINS prior to the submission of the EIA Scoping Report.

1.7.4 The Applicant is undertaking formal Section 42 and Section 47 consultation commencing at the same time as the publication of this PEI Report.

1.7.5 The issues that have been raised through consultation (on both the Consented Development and the Proposed Development) and how these have been considered and addressed within the design evolution of the Proposed Development and the EIA will be set out in the ES.

1.7.6 The pre-application consultation undertaken by the Applicant will be documented within a Consultation Report that will form part of the DCO application. This will include a separate section on EIA related consultation as recommended within PINS Advice Note Fourteen: Compiling the Consultation Report (PINS, 2012).

1.8 Statement of Competence

1.8.1 The final ES will include a statement of the relevant expertise and qualifications of each of the contributors as required by Regulation 14(4)(b) of the EIA Regulations. For this PEI Report a summary of competence and the experience of the EIA Co-ordinators is provided at Appendix 1C (PEI Report Volume III).

1.9 References

Planning Inspectorate (2012) *Advice Note Fourteen: Compiling the Consultation Report, Version 2 April 2012*

Planning Inspectorate (2017) *Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements, Version 6 December 2017*

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2.0 ASSESSMENT METHODOLOGY

2.1 Environmental Impact Assessment Approach and Scope

- 2.1.1 This Preliminary Environmental Information (PEI) Report has been prepared to satisfy the requirements of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) (the 'EIA Regulations') in relation to the proposed Development Consent Order (DCO) application ('the Application') outlined within Chapter 1: Introduction.
- 2.1.2 In preparing this PEI Report, reference has been made to the following guidance:
- Advice Note Three: EIA Notification and Consultation (Planning Inspectorate (PINS), 2017a);
 - Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements (PINS, 2017b);
 - Advice Note Nine: Rochdale Envelope (PINS, 2018); and
 - Advice Note Seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects (PINS, 2019).
- 2.1.3 Reference has also been made to the Scoping Opinion received from the Secretary of State (SoS) received on 2nd October 2019 (Appendix 1B, PEI Report Volume III) and the advice contained within it regarding assessment methodology, topics and presentation of the final ES.
- 2.1.4 In response to the Scoping Opinion, the EIA and this PEI Report include assessments of the following environmental topics:
- air quality;
 - noise and vibration;
 - traffic and transport;
 - ecology and nature conservation;
 - landscape and visual amenity;
 - geology, hydrogeology and land contamination;
 - cultural heritage;
 - water resources, flood risk and drainage;
 - socio-economics;
 - waste management; and
 - cumulative and combined effects.
- 2.1.5 As requested in the EIA Scoping Opinion (Appendix 1B, PEI Report Volume III), the final ES will include clear signposting to the sections of the ES that consider major accidents (including in relation to nearby hazardous installations), natural disasters (including severe weather events), public health, and climate change. A summary of key points relevant to these topics is provided below.

Major Incidents and Natural Disasters

- 2.1.6 Accidental events such as the potential for fuel spillages, fires and abnormal air emissions, and how the risk of these events will be minimised and impacts managed, is discussed in the relevant chapters of the PEI Report including Chapter 4: The Proposed Development; Chapter 7: Air Quality, Chapter 12: Geology, Hydrogeology and Land Contamination, and Chapter 14: Flood Risk, Hydrology and Water Resources. The majority of emergency response plans and contingency measures will be addressed in the Environmental Permit required for the operation of the Proposed Development, which is regulated by the Environment Agency.
- 2.1.7 Consultation with the Health and Safety Executive (HSE) was carried out in relation to the Consented Development giving due consideration to the consultation zones for nearby potentially hazardous installations and pipelines using the HSE's Land Use Planning Methodology. The Site contains areas within HSE Inner, Middle and Outer Consultation Zones of other nearby facilities. The HSE issued a 'Do not Advise Against' response to the consultation on the planning application for the Consented Development as no workplaces accommodating more than 100 occupants or with three or more storeys were proposed within the Inner Zone. Whilst the HSE will be consulted again on the Proposed Development, the development layout is not expected to change in this regard subsequent to when the HSE was consulted on the Consented Development and there has been no change to HSE's Land Use Planning Methodology guidance, so the same response is anticipated.
- 2.1.8 Relevant issues relating to natural disasters (storms and flooding) are covered in Chapter 14: Water Resources, Flood Risk and associated Flood Risk Assessment (PEI Report Volume III, Appendix 14A).
- 2.1.9 No other potential major incidents and natural disasters relevant to the Site and the Proposed Development have been identified.
- 2.1.10 On the basis of paragraphs 2.1.6 to 2.1.9 above, a separate Major Incidents and Natural Disasters chapter is not included.

Human Health

- 2.1.11 Human health impacts including air and noise emissions, contaminated land, water quality, waste management and socio-economics are considered in the relevant chapters of this PEI Report including Chapter 7: Air Quality, Chapter 8: Noise and Vibration, Chapter 12: Geology, Hydrogeology and Land Contamination, Chapter 14: Flood Risk, Hydrology and Water Resources, Chapter 15: Socio-Economics and Chapter 16: Waste Management.
- 2.1.12 A Human Health chapter will be included in the final ES to signpost the relevant sections of the technical chapters covering matters relating to human health.

Sustainability and Climate Change

- 2.1.13 Relevant sustainability and climate change considerations that have been incorporated into the design of the Proposed Development are covered within the relevant chapters of the PEI Report.
- 2.1.14 The main climate change consideration is future flood risk taking into account climate change effects, and associated measures required to ensure the Proposed Development is designed appropriately (e.g. surface water attenuation, flood resilient design) (see Flood Risk Assessment in Volume III, Appendix 14A).
- 2.1.15 Sustainability is also relevant to the need for an additional waste management facility (the Proposed Development), which comprises a form of renewable energy. This is

considered in Chapter 6: Need, Alternatives and Design Evolution and will also be considered in the Planning Statement that will accompany the Application.

- 2.1.16 Carbon dioxide emissions will be considered as part of the air quality assessment in the final ES (see Chapter 7: Air Quality).
- 2.1.17 A Sustainability and Climate Change chapter will be included in the final ES to signpost the relevant sections of the technical chapters covering matters relating to sustainability and climate change.

Scoped Out Topics

- 2.1.18 The EIA Scoping Report and subsequent EIA Scoping Opinion concluded that two specific topics did not need to be considered as part of the EIA for the Proposed Development and could be scoped out. These topics, and the reasons for them being scoped out, are considered below.

Aviation

- 2.1.19 The Civil Aviation Authority (CAA) has a general interest in charting all known structures of 91.4 m (300 feet) or more above ground level and may also require lighting at the top of tall structures. The existing South Humber Bank Power Station stacks are 75 m in height and have lighting at the top for aviation purposes. The Proposed Development top of the stacks will be fixed at 102 m AOD.
- 2.1.20 The Proposed Development is within 14 km of Humberside International Airport and is within the Safeguarding area for the Airport. Consultation with Humberside Airport determined that the Airport would not object unless the stack height was over 171 m.
- 2.1.21 The CAA and Humberside Airport were formally consulted through the planning application process for the Consented Development and as a result of this consultation a planning condition is attached to the Planning Permission requiring:
- notification to the Defence Geographic Centre of the location of development and details of construction (dates and structure/ equipment heights); and
 - aviation warning lighting to be fitted to the stacks at the highest practicable point on the structure.
- 2.1.22 The same requirements are expected to apply to the Proposed Development, and through their application no assessment of aviation impacts is therefore required as part of the EIA.

Electronic Interference

- 2.1.23 The introduction of new structures of significant height and bulk into an environment can cause disruption to the reception of electromagnetic waves. Although this effect relates to both radio and TV signals, TV reception is potentially more affected and as such only TV reception has been considered. The proposed maximum building heights will be no higher than the existing stacks at South Humber Bank Power Station, and the proposed stacks will be 100 m in height. The expected maximum heights of temporary construction cranes will be similar to the height of the proposed stacks.
- 2.1.24 Terrestrial television signals are transmitted in digital format. The only relevant interference mechanism affecting digital terrestrial TV signals is attenuation due to buildings physically blocking (and absorbing) them. If the TV signals are too weak then the pictures very quickly deteriorate into random 'blocks' and then disappear altogether.
- 2.1.25 Given the height and mass of the buildings, stacks and temporary structures associated with the Proposed Development, the lack of nearby residential properties and the lack of any sight lines between transmission antenna and residential areas being obscured by

the Proposed Development, it is considered that an assessment of the Proposed Development's effect on electronic interference is not required and

2.2 Preliminary Environmental Information (PEI) Report

2.2.1 This PEI Report presents a description of the Proposed Development and its likely significant environmental effects on the environment during construction, operation (including maintenance where relevant) and decommissioning, based on the preliminary environmental information available at the time. It also details measures to avoid or reduce such effects and the alternatives considered.

2.2.2 This PEI Report includes a summary of the following activities in a level of detail considered sufficient to inform consultees for the purposes of the consultation and based on the information available:

- establishing the baseline conditions;
- consultation with statutory and non-statutory consultees;
- consideration of relevant local, regional and national planning policies, guidelines;
- adherence to legislation relevant to EIA;
- consideration of technical standards for the development of significance criteria;
- application of specialist assessment methodologies;
- design review;
- review of secondary information, previous environmental studies, publicly available information and databases;
- expert opinion;
- physical surveys and monitoring;
- desk-top studies;
- modelling and calculations; and
- reference to current guidance.

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

2.2.4 The term 'impact' refers to changes arising from the Proposed Development, whereas the term 'effect' is used to describe the result of the impact on a receptor.

2.2.5 The technical chapters within this PEI Report (Chapters 7-16) each follow the same structure for ease of reference, which is:

- Introduction;
- Legislation and Planning Policy Context;
- Assessment Methodology and Significance Criteria;
- Baseline Conditions;
- Development Design and Impact Avoidance;
- Likely Impacts and Effects, both of the Proposed Development in isolation and the Proposed Development compared to the Consented Development;

- Mitigation and Enhancement Measures;
- Limitations or Difficulties;
- Residual Effects and Conclusions; and
- References.

2.3 Study Areas: Spatial Scope of Assessment

- 2.3.1 The technical assessment chapters of this PEI Report describe as necessary their spatial scope including their rationale for determining the specific area within which the assessment is focussed. The study areas are a function of the nature of the impacts and the locations of potentially affected environmental resources or receptors.

2.4 Assessment Years and Assessment Scenarios: Temporal Scope of Assessment

- 2.4.1 The approach to assessment has been to identify the environmental impacts of the Proposed Development at key stages in its construction, operation and eventual decommissioning.
- 2.4.2 There are several scenarios being considered for the construction and subsequent operation of the Proposed Development. These scenarios are outlined in more detail in Chapter 4: The Proposed Development and Chapter 5: Construction Programme and Management. However, for the purposes of the EIA, to ensure a robust assessment of environmental impacts, a worst case scenario will be identified and assessed for each topic in Chapters 7 to 16 of the PEI Report. Where it is not necessarily clear which scenario will represent the worst case for a particular topic, all relevant scenarios will be assessed.

Baseline Conditions (including Future Baseline)

- 2.4.3 In order to assess the potential impacts and effects of the Proposed Development, it is necessary to determine the environmental conditions that currently exist on the Site and in the surrounding area, for comparison. These are known as the existing baseline conditions. Baseline conditions are determined using the results of site surveys and investigations or desk-based data searches, or a combination of these, as appropriate.
- 2.4.4 It is also relevant for the EIA to consider future baseline conditions taking account of any planned or likely changes to the existing baseline. For the Proposed Development, the future baseline conditions at the Site may be similar to the existing baseline conditions (if the Consented Development is not progressed) or may be different (if the Consented Development is progressed).
- 2.4.5 The assessments therefore provide a comparison against both future baseline scenarios (with and without the Consented Development). This provides an understanding of the effects of the Proposed Development as a whole, and also an understanding of the additional effects arising from the Proposed Development compared to the Consented Development.
- 2.4.6 This PEI Report presents baseline information representing the understanding at the time of writing.
- 2.4.7 Most of the baseline surveys for the Consented Development were undertaken in 2018. These are considered to be still relevant and valid and have been used to inform the EIA for the Proposed Development. Where any new data is being obtained this is noted within the relevant chapters.

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

- Existing Baseline (without Proposed Development) – the year that the baseline data has been collected;
- Future Baseline (without Proposed Development) – for comparison respectively with the Construction and Operation scenarios described below, including consideration of future baseline conditions with and without the Consented Development;
- Construction of the Proposed Development – Chapters 7-16 identify and assess the relevant 'worst case' construction scenario for each topic;
- Opening and/or Operation of the Proposed Development (where Opening represents the start of operation) – as for Construction, Chapters 7-16 identify and assess the relevant 'worst case' scenario for each topic where necessary; and
- Decommissioning of the Proposed Development.

2.5 Development Design, Impact Avoidance and Mitigation

2.5.1 Measures that have been integrated into the Proposed Development in order to avoid or reduce adverse environmental effects will be described. Such measures may include refinement of the design and layout of the Proposed Development to avoid impacts on sensitive receptors, implementation of Environmental Management Plans, and adherence to relevant legislation, guidance and best practice. The assessment of impacts and effects has been undertaken on the basis of these measures being implemented (i.e. they are 'embedded mitigation').

2.5.2 The key aspects where the design has evolved are described in Chapter 6: Need, Alternatives and Design Evolution.

2.5.3 Once the likely effects have been identified and quantified, consideration has then been given to any further mitigation (over and above anything identified within the Development Design and Impact Avoidance sections of each technical chapter) that may be required to mitigate any significant adverse effects identified. These measures are described in the Mitigation and Enhancement Measures sections of each technical chapter. The residual effects (after the implementation of mitigation) are then assessed and presented at the end of each technical chapter. Significant residual effects are also summarised in Chapter 18: Summary of Significant Effects.

2.6 Impact Assessment Methodology and Significance Criteria

2.6.1 Impacts are defined as changes arising from the Proposed Development, and consideration of the result of these impacts on environmental receptors enables the identification of associated effects, and their classification (major, moderate, minor and negligible, and adverse, neutral or beneficial). Each effect has been classified both before and after mitigation measures have been applied.

2.6.2 The classification of effects is undertaken with due regard to the following:

- extent (local, regional or national) and magnitude of the impact;
- effect duration (whether short, medium or long-term);
- effect nature (whether direct or indirect, reversible or irreversible);
- whether the effects occur in isolation, are cumulative or interactive;
- performance against environmental quality standards and in the context of relevant legislation, standards and accepted criteria;

- sensitivity of receptors;
- for some effects, the number of receptors affected;
- compatibility with environmental policies; and
- professional experience and judgment of the assessor.

2.6.3 Further details are provided in each technical assessment chapter where appropriate.

2.6.4 Where it has not been possible to quantify (quantitatively assess) effects, qualitative assessments have been carried out, based on available knowledge and professional judgment. Where any uncertainty exists, this has been noted as limitations to the assessment within the Limitations or Difficulties section of each technical chapter.

2.6.5 To enable comparison between technical topics and aid understanding within the PEI Report, standard terms are used wherever possible to classify potential effects (major, moderate, minor and negligible), and effects are also described as being adverse, neutral or beneficial.

2.6.6 Definitions of the standard terms are provided below:

- negligible – imperceptible effect to an environmental resource or receptor;
- minor – slight, very short or highly localised effect;
- moderate – limited effect (by extent, duration or magnitude);
- major – considerable effect (by extent, duration or magnitude) of more than local scale or in breach of recognised acceptability, legislation, policy or standards;
- adverse – detrimental or negative effects to an environmental resource or receptor;
- neutral – effects to an environmental resource or receptor that are neither advantageous or detrimental; and
- beneficial – advantageous or positive effect to an environmental resource or receptor.

2.6.7 Moderate and major effects are generally considered to be 'significant' for the purposes of the EIA Regulations, in accordance with standard EIA practice.

2.6.8 Each of the technical chapters provides further description and definition of the assessment criteria relevant to each topic. Where possible, this has been based upon quantitative and accepted criteria (for example, British Standards), together with the use of value judgment and expert interpretation to classify effects.

2.6.9 In general, the classification of an effect is based on the magnitude of the impact and sensitivity or importance of the receptor, using the matrix shown at Table 2.1. Where there are deviations away from this matrix (due to the technical guidance for a specific assessment topic), this is highlighted within the relevant technical chapter and the reason for the variation explained.

Table 2.1: Classification of Effects

MAGNITUDE OF IMPACT	SENSITIVITY/IMPORTANCE OF RECEPTOR			
	High	Medium	Low	Very Low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very Low	Minor	Negligible	Negligible	Negligible

- 2.6.10 Short term effects are considered to be those associated with the construction phase and which cease when construction works are completed; long term effects are those associated with the completed, operational development and which will last for the duration of the operational phase. Effects may also be permanent (irreversible) or temporary (reversible) and direct or indirect.

2.7 Cumulative and Combined Effects

- 2.7.1 In accordance with the EIA Regulations, consideration is given to the potential for cumulative and combined effects to arise as a result of the Proposed Development.
- 2.7.2 Cumulative effects are those that accrue over time and space from a number of development activities. The impact of the Proposed Development will be considered in conjunction with the potential impacts from other projects or activities which are reasonably foreseeable in terms of delivery (i.e. have been submitted but not yet approved or have planning consent), located within a geographical scope where environmental impacts could act together to create a more significant overall effect on a receptor and where sufficient environmental information is available.
- 2.7.3 Combined effects are those resulting from a single development, in this case the 'Proposed Development', on any one receptor that may collectively cause a greater effect (such as the combined effects of noise and air quality/ dust impacts during construction on local residents).
- 2.7.4 Cumulative and combined effects are discussed in Chapter 17 of this PEI Report.

2.8 References

Planning Inspectorate (2017a) *Advice Note Three: EIA Notification and Consultation, Version 7, August 2017*

Planning Inspectorate (2017b) *Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements, Version 6, December 2017*

Planning Inspectorate (2018) *Advice Note Nine: Rochdale Envelope, Version 3, July 2018*

Planning Inspectorate (2019) *Advice Note Seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects, Version 2, August 2019*

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3.0 DESCRIPTION OF THE PROPOSED DEVELOPMENT SITE

3.1 Site Location

3.1.1 The Proposed Development Site ('the Site') is located off South Marsh Road, Stallingborough, North East Lincolnshire and is located within the administrative area of North East Lincolnshire Council (NELC).

3.1.2 This Chapter is supported by Figures 3.1 - 3.3 in PEI Report Volume II.

3.2 The Proposed Development Site

3.2.1 The Site, as defined by the proposed Application boundary, is around 25 hectares (ha) in area. The full extent of the Site is shown on Figure 3.1 in PEI Report Volume II. The Site is centred on approximate grid reference TA 230 133.

3.2.2 For the purposes of the Environmental Impact Assessment (EIA), the following terms are used to describe the Site and its component parts (see Figure 3.1):

- 'the Site' – the proposed Application boundary, which includes the existing South Humber Bank Power Station (SHBPS);
- 'the Main Development Area' – this is the area within the Site where the Proposed Development, other than the ecological mitigation and enhancement area, the visual screening and the construction laydown areas, will be located;
- ecological mitigation and enhancement area – this comprises an area within the Site, to the west of SHBPS and the Main Development Area, where ecological mitigation and enhancement works are proposed; and
- the construction laydown areas – temporary areas within the Site and outside of the Main Development Area, to be used during the site preparation and construction.

3.2.3 The Site includes the existing SHBPS which is owned and operated by EP SHB Limited, a subsidiary of EP UK Investments Limited (EPUKI). SHBPS consists of two combined cycle gas turbine (CCGT) units fired by natural gas, with a combined gross electrical capacity of approximately 1,400 MW.

3.2.4 The Main Development Area is shown on Figure 3.1 in PEI Report Volume II and is located to the east of the existing CCGT plant and to the west of the cooling water pumping station. The Main Development Area occupies an area of circa 7 ha and currently comprises a vegetated area, with underground cooling water pipes (connecting the CCGT units and the cooling water pumping station), other buried services and an associated access road.

3.2.5 The Site is largely flat and typically stands at around 2.0 metres Above Ordnance Datum (m AOD).

3.2.6 Drainage ditches run along the northern, western and southern perimeters of the Site.

3.2.7 The remainder of the Site comprises the existing SHBPS and land to the west of SHBPS, part of which is proposed to be used for ecological mitigation and enhancement.

3.3 Site History

3.3.1 SHBPS was constructed in two phases between 1997 and 1999. In 2017 Centrica sold SHBPS to EPUKI.

- 3.3.2 Historic Ordnance Survey (OS) maps have been studied to determine the previous land uses within the Site and surrounding land as detailed in Table 3.1 below.

Table 3.1: Review of historical maps relating to the Site

HISTORICAL MAP DATES	ONSITE LAND USE	OFFSITE LAND USE
1887 – 1888	Agricultural land use.	Agricultural land use.
1907 – 1908	No significant changes.	No significant changes.
1932 – 1933	No significant changes.	Light railway shown running north-west to south-east to the east of the Site.
1938 – 1956	No significant changes.	No significant changes.
1966	No significant changes.	Works complex and associated pipelines located circa 500 m to 1 km the south-east of the Site.
1968	No significant changes.	Works complex located to the immediate north of South Marsh Road. Watercress beds shown circa 890 m to the east at Primrose Cottage. Works complex (Tronox, previously Cristal and Millennium Inorganic Chemicals) located circa 1.1 km to the north of the Site.
1982	No significant changes.	Aforementioned works complexes both extended to the east.
1986 – 1989	No significant changes.	Extension to works complex (Tronox) located circa 1.1 km to the north of the Site.
2000	SHBPS has been constructed with associated power line to the west.	New works complex (BOC Gases) located circa 430 m to the north-west of the Site to the north of Middle Drain.
2006	Changes to buildings associated with the SHBPS along the western boundary of the Site. Additional waterbody shown to the south of South Marsh Road.	Waterbody shown circa 240 m to south of the Site. Underground pipeline circa 300 m to the north-east of the Site extending from the shoreline out into the Humber Estuary.
2018	No significant changes.	BOC Gases works complex extended to land south of Middle Drain, circa 295 m to the west of the Site.

3.4 The Surrounding Area

- 3.4.1 The Site is located on the South Humber Bank between the towns of Immingham and Grimsby; both over 3 km from the Site.
- 3.4.2 The surrounding area is characterised by a mix of industrial and agricultural land use with the nearest main settlements being the villages of Stallingborough, Healing and Great Coates. There is a concentration of industrial land uses on the South Humber Bank along the bank of the Humber Estuary.
- 3.4.3 The area surrounding the Site immediately to the south, west and north-west is in agricultural use with a polymer manufacturing site (Synthomer (UK) Limited) and the NEWLINCS waste management facility both located to the north of the Site beyond South Marsh Road. The Humber Estuary lies around 175 m to the east of the Site.
- 3.4.4 Access to the South Humber Bank is via the A180 Trunk Road and the A1173. The Barton railway line runs north-west to south-east between Barton-on-Humber and Cleethorpes circa 2.5 km to the south-west of the Site and a freight railway line runs north-west to south-east circa 300 m (at the closest point) to the Site.
- 3.4.5 In addition to the drainage ditches around the majority of the perimeter of the Site, the Oldfleet Drain is located approximately 300 m south of the Main Development Area. A large pond lies off-site approximately 400 m south of the Main Development Area and just to the south of the Oldfleet Drain.

3.5 Potential Environmental Sensitivities/ Receptors

- 3.5.1 A number of environmental receptors relevant to the EIA have been identified within and outside the Site, as described below. All distances given are the shortest distance between the receptor and the closest point of the Site boundary.
- 3.5.2 Key receptors for each topic area have been identified as part of the assessment process and details are included in the relevant technical chapters (Chapters 7 – 17 of this PEI Report). A summary is also provided below.

Residential Receptors

- 3.5.3 There are no residential receptors within 500 m of the Site.
- 3.5.4 The closest residential properties (individual receptors) are located approximately 1 km west and are presented on Figure 3.2 in PEI Report Volume II. These are:
- Poplar Farm (located on South Marsh Road); and
 - Primrose Cottage (accessed via Station Road north of the A180).
- 3.5.5 There are eight other residential properties located within 2 km of the Site.
- 3.5.6 The nearest settlement is the village of Stallingborough over 2 km away.
- 3.5.7 Potential effects on residential receptors are considered in Chapter 7: Air Quality, Chapter 8: Noise and Vibration, Chapter 9: Traffic and Transport, and Chapter 11: Landscape and Visual Amenity.

Designated Nature Conservation Sites

- 3.5.8 The Site is not subject to any statutory or non-statutory ecological designations.
- 3.5.9 Designated nature conservation sites in the vicinity of the Site are presented on Figure 3.2 in PEI Report Volume II) and summarised below.
- 3.5.10 The Humber Estuary is located around 175 m to the east of the Site and is designated as a Ramsar site, Special Protection Area (SPA), Special Area of Conservation (SAC)

and Site of Special Scientific Interest (SSSI). There are no other SSSIs within 2 km or European designated sites within 10 km of the Site.

3.5.11 There are four Local Wildlife Sites (LWS) within 2 km of the Site:

- Healing Cress Beds Stallingborough LWS – approximately 0.7 km south-west;
- Sweedale Croft Drain LWS – approximately 0.8 km south-east;
- Laporte Road Brownfield Site LWS – approximately 1 km north-west; and
- Fish Ponds to the West of Power Station, Stallingborough LWS – approximately 1 km south-west.

3.5.12 There are two Sites of Nature Conservation Importance (SNCI) identified within 2 km of the Site:

- Field West of Power Station Stallingborough SNCI (approximately 30 m south-west); and
- North Moss Lane Meadow SNCI (approximately 0.9 km north-west).

3.5.13 The potential effects of the Proposed Development on designated nature conservation sites and other ecological receptors are considered in Chapter 10: Ecology and Nature Conservation of this PEI Report, with supporting information provided in Chapter 7: Air Quality and Chapter 8: Noise and Vibration.

Traffic and Transport Receptors

3.5.14 South Marsh Road provides highway access to the SHBPS and also to Synthomer (UK) Limited and the NEWLINCS Integrated Waste Management Facility, both located north of the Site. It is understood that South Marsh Road is also used by the Environment Agency to access flood defences along the bank of the Humber Estuary east of the existing SHBPS cooling water pumping station.

3.5.15 The Site is not crossed by any public rights of way.

3.5.16 There are two public rights of way within 500 m of the Site – a public footpath located to the north, passing in an east-west direction from Hobson Way to the coastline, where it connects to a public bridleway which runs in a north-south direction along the Humber Estuary to the east of the Site.

3.5.17 The potential traffic and transport effects of the Proposed Development are considered in Chapter 9: Traffic and Transport.

Air Quality

3.5.18 NELC declared an Air Quality Management Area (AQMA) on Cleethorpe Road (numbers 100-176 and 103-177) Grimsby in 2010, for a breach in the nitrogen dioxide annual mean objective. The AQMA is located circa 5.1 km south-east of the Site.

3.5.19 Air quality effects are considered in Chapter 7: Air Quality.

Geology and Hydrogeology

3.5.20 The geology underlying the Site comprises superficial deposits of Tidal Flat deposits (clay and silt) underlain by Glacial Deposits (clay and sand).

3.5.21 The superficial deposits are designated as unproductive strata with low permeability; however permeable sand layers are likely to contain groundwater.

3.5.22 Bedrock at the Site is the Flamborough Chalk Formation and is designated as a Principal Aquifer. The nearest source protection zones from the Chalk aquifer are approximately 2 km to the south-west and north-west. Available groundwater

monitoring data indicates that groundwater within the Chalk is likely to be confined beneath the overlying low-permeability superficial deposits.

3.5.23 The Site is located within a nitrate vulnerable zone (NVZ) (North Beck Drain NVZ).

3.5.24 The potential geological and hydrogeological effects of the Proposed Development are considered in Chapter 12: Geology, Hydrogeology and Land Contamination of this PEI Report.

Hydrology and Flood Risk

3.5.25 The Site is located in Flood Zone 3a (as shown on the Flood Map for Planning (Rivers and Sea)). Zone 3a is land that has a 1 in 100 or greater annual probability of river flooding; or land that has a 1 in 200 or greater annual probability of sea flooding. However, the Site benefits from the presence of tidal flood defences along the south bank of the Humber Estuary which are maintained by the Environment Agency.

3.5.26 The nearest designated watercourse is the Oldfleet Drain, located approximately 300 m to the south of the Main Development Area (at its closest point) which is classed by the Environment Agency as a Main River.

3.5.27 The Site is located around 175 m from the Humber Estuary. At this location the Humber is classified under Water Framework Directive as an Estuarine and Coastal Water Body GB 530402609201.

3.5.28 The potential hydrological effects of the Proposed Development (including a flood risk assessment) are considered in Chapter 14: Flood Risk, Hydrology and Water Resources of this PEI Report.

Cultural Heritage

3.5.29 There are no designated heritage assets within the Site.

3.5.30 There are three Scheduled Monuments located within 5 km of the Site:

- Stallingborough medieval settlement, post-medieval house and formal gardens (NHLE 1020423) is located approximately 3.3 km to the west of the Site;
- the churchyard cross 20 m south of St Peter and St Paul's Church (NHLE 1020023), Stallingborough is located approximately 3.3 km to the west of the Site; and
- two moated sites at Healing Hall (NHLE 1010947) are located approximately 3.2 km to the south-west of the Site.

3.5.31 There are six listed buildings within 3 km of the Site. These are all designated Grade II and located within existing settlements. A further seven Listed Buildings have been identified within a 5 km radius that have either a Grade I or Grade II* designation.

3.5.32 The Great Coates Conservation Area is located circa 2.6 km to the south of the Site.

3.5.33 There are also seven non-designated archaeological sites within 1 km of the Site.

3.5.34 The potential effects on heritage assets are considered in Chapter 13: Cultural Heritage of this PEI Report.

Landscape

3.5.35 At a national scale the Site and its immediately surrounding area is located in National Character Area (NCA) 41: Humber Estuary and NCA 42: Lincolnshire Coast and Marshes.

3.5.36 At a regional scale the area in which the Site is located is characterised within the North East Lincolnshire Landscape Character Assessment, Sensitivity and Capacity Study

2015 (NELLCA). Local Character Areas (LCAs) relevant to the Site on a regional scale, are:

- Humber Estuary; and
- Lincolnshire Coast and Marshes.

3.5.37 At a local scale three relevant Local Landscape Types are identified in Section 5 (Character) of the NELLCA as follows:

- Landscape Type 1: Industrial Landscape;
- Landscape Type 2: Open Farmland; and
- Landscape Type 3: Wooded Open Farmland.

3.5.38 The effects of the Proposed Development on the landscape are considered in Chapter 11: Landscape and Visual Amenity of this PEI Report.

3.6 References

British Geological Survey (BGS) (1991) *England Wales Sheet 81 Patrington Solid and Drift Geology (1:50,000 scale map and memoir)*

Coal Authority (undated) *Online interactive maps* accessed 18/09/2019

Department of Environment, Farming and Rural Affairs (undated) *MAGIC website* <https://magic.defra.gov.uk/magicmap.aspx>

Environment Agency (undated) *Flood Map for Planning website* <https://flood-map-for-planning.service.gov.uk/>

Landmark (2018) *Envirocheck Report 169911223_1_1 (14 June 2018)*

Natural England (2013) *NCA Profile 41: Humber Estuary (NE344)*

Natural England (2013) *NCA Profile 42: Lincolnshire Coast and Marshes (NE521)*

North East Lincolnshire Council (undated) *Air Quality Management Areas website* <https://www.nelincs.gov.uk/environment-and-community-safety/environmental-health/air-quality/air-quality-management-areas/>; and

North East Lincolnshire Council (2015) *North East Lincolnshire Council Landscape Character Assessment, Sensitivity and Capacity Study*

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4.0 THE PROPOSED DEVELOPMENT

4.1 Introduction

- 4.1.1 The Proposed Development is an energy from waste power station with a gross electrical generation capacity of up to 95 MW.
- 4.1.2 The nominal design capacity of the facility is 616,500 tonnes per annum of Refuse Derived Fuel (RDF) based on a design net calorific value (NCV) of 11 MJ/kg and the expected plant annual running hours. The plant is capable of maintaining the maximum electrical output while combusting fuel in a range of NCVs between 9 and 14 MJ/kg. The maximum fuel throughput of the Proposed Development is theoretically 753,500 tonnes per annum if only fuel with a NCV of 9 MJ/kg were used and based on the expected plant annual running hours.
- 4.1.3 The design of the Proposed Development incorporates a degree of flexibility in the dimensions and configurations of buildings to allow for the selection of the preferred technology and contractor, although the stack positions are fixed to a defined area of the Site.
- 4.1.4 In order to ensure a robust assessment of the likely significant environmental effects of the Proposed Development, the Environmental Impact Assessment (EIA) is being undertaken adopting the principles of the 'Rochdale Envelope' approach where appropriate. This involves assessing the maximum (or where relevant, minimum) parameters for the elements where flexibility needs to be retained (building dimensions for example). Where this approach is being applied to the specific aspects of the EIA, this is confirmed within the relevant chapters of this Preliminary Environmental Information (PEI) Report. Justification for the need to retain flexibility in certain parameters is also outlined in this chapter and in Chapter 6: Alternatives and Design Evolution.
- 4.1.5 Full planning permission for a 49.9 MW energy from waste power station was granted by North East Lincolnshire Council (NELC) under the Town and Country Planning Act 1990 on 12th April 2019 (referred to as the 'Consented Development'). Since the grant of planning permission for the Consented Development ('the Planning Permission') the Applicant has been assessing potential opportunities to improve its efficiency. The Applicant is now proposing an up to 95 MW energy from waste power station ('the Proposed Development').
- 4.1.6 Whilst the Development Consent Order (DCO) is being sought, the Applicant is likely to progress the Consented Development in accordance with the Planning Permission. An approximately three year construction programme is anticipated for the Consented Development, with construction expected to commence in Quarter 1 (Q1) 2020. Following grant of a DCO for the Proposed Development (which would be anticipated around Q3 2021, approximately half way through the three year construction programme for the Consented Development), the additional works that would be required (in addition to those which benefit from the Planning Permission) would then be constructed, and the Proposed Development would commence operation in 2023.
- 4.1.7 Whilst this is the most likely construction programme scenario for the Proposed Development, two other potential construction programme scenarios are also being considered in order that a robust assessment of environmental effects is undertaken. The alternative scenarios relate to the potential for the Proposed Development to be constructed and operated pursuant to only the DCO and commencing either in Q3 2021 (when the DCO would be granted) or Q3 2026 (before the DCO would expire). In these

two alternative scenarios the Proposed Development would commence operation in 2024 or 2029 respectively.

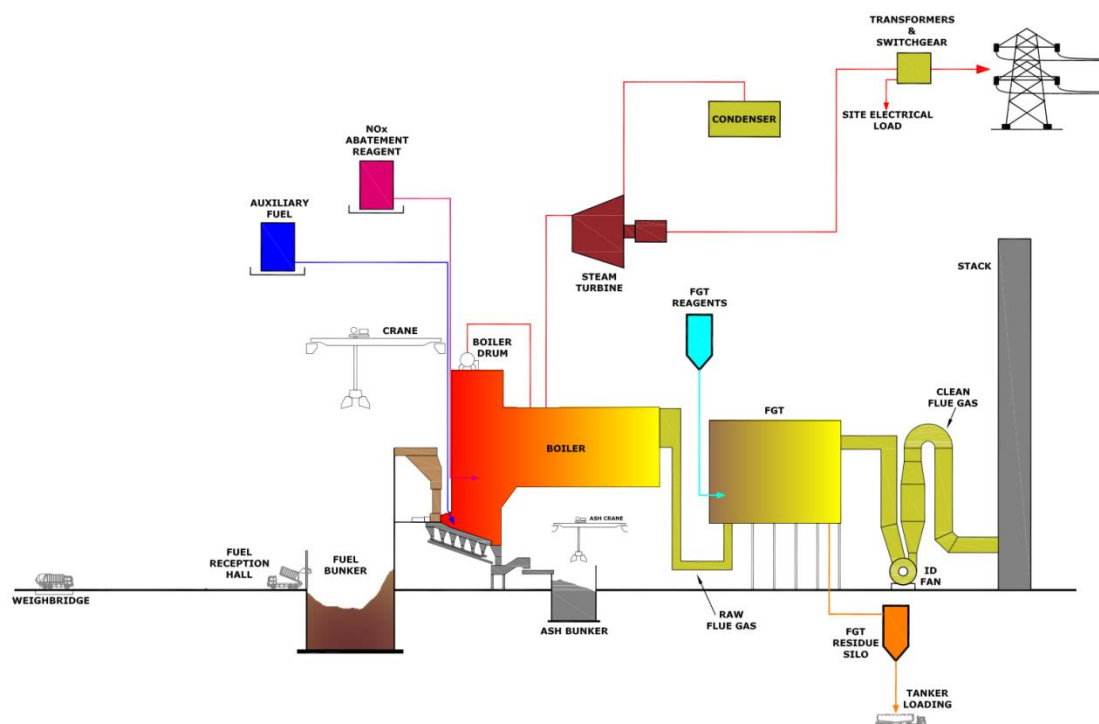
- 4.1.8 Construction of the Proposed Development is detailed in Chapter 5: Construction Programme and Management. At this stage a detailed construction programme is not available as this is normally determined by the Engineering Procurement and Construction (EPC) contractor who has not yet been appointed; however an indicative programme is presented within Chapter 5.
- 4.1.9 It is envisaged that the Proposed Development will have a design life of at least 30 years. At the end of the design life, the Proposed Development would either be decommissioned as outlined in Section 4.9 below or the lifetime could potentially be extended. Decommissioning will therefore commence at some point after 2052.
- 4.1.10 This chapter is supported by Figures 4.1 to 4.3 in PEI Report Volume II, which show the Proposed Development layout, the indicative ecological mitigation and enhancement area, and a comparison of the Consented and Proposed Development layouts for reference.

4.2 Components of the Proposed Development

- 4.2.1 The purpose of this chapter is to provide further detail on the various components of the Proposed Development, both internal and external, including buildings, infrastructure and access. All of the various components which make up the Proposed Development are contained within the Application boundary (the Site).
- 4.2.2 The Proposed Development will comprise a main building which will contain:
- fuel reception hall including storage bunker;
 - boiler house (which contains the main elements of the combustion process);
 - flue gas treatment (FGT) hall;
 - turbine hall; and
 - administration block including control room, workshops and stores.
- 4.2.3 In addition, the Proposed Development will include:
- an air cooled condenser (ACC) adjacent to the turbine hall;
 - up to two emissions stacks adjacent to the FGT hall;
 - by-product handling and storage facilities;
 - access from South Marsh Road;
 - weighbridges, gatehouse, internal access roads and footways, barriers, enclosures and parking facilities for staff and visitors;
 - substation and associated electrical connections;
 - potential gas connection;
 - storage tanks and silos;
 - auxiliary generator(s);
 - drainage and water connections and surface water attenuation;
 - heavy goods vehicle (HGV) holding area and driver welfare facilities; and
 - landscaping and biodiversity enhancement measures.

- 4.2.4 The buildings will be steel framed and concrete floored with appropriate external cladding, which will be appropriately coloured to minimise the visual impact of the Proposed Development (see Chapter 11: Landscape and Visual Amenity).
- 4.2.5 Each part of the Proposed Development is described in further detail below, and the process is graphically illustrated in Plate 4.1 below. The maximum dimensions of each component are provided in Section 4.3 Design Parameters.

Plate 4.1: Process diagram



Fuel Reception and Storage

- 4.2.6 The fuel reception area may be raised above ground level by approximately 3.5 m with access and egress via ramps (in order to reduce the depth of excavation required for the fuel bunker). The reception area will incorporate tipping bays to allow multiple vehicles to discharge to the concrete fuel bunker at the same time. The entry and exit doors to the fuel reception hall will be equipped with automated vertical folding or roller doors, which will be kept closed except for times of vehicle access and egress.
- 4.2.7 The bunker will be large enough to provide for up to four days of fuel supply, in case of periods when there are no fuel deliveries. The base of the bunker will be approximately 10 m below the fuel reception hall floor. Cranes will span the bunker.
- 4.2.8 Fuel delivered to the Site is not expected to require further pre-treatment. However, the fuel will need mixing prior to combustion to improve homogeneity, and may require shredding to ensure any large items do not cause a blockage. Typically, mixing is done using the cranes in the bunker and a shredder may be installed in the bunker.
- 4.2.9 The primary air for the boiler will be extracted from above the bunker, thereby maintaining a negative pressure and minimising the release of dust and odours.

Boiler House (Combustion System)

- 4.2.10 The boiler house will contain two combustion lines and associated boilers to produce steam for the generation of electricity or for export.
- 4.2.11 A reciprocating grate system will be used together with combustion air preheating. Auxiliary burners will be installed for use on start up or when required to maintain a two second residence time in the combustion chamber above 850°C. These burners will either be fired on natural gas or distillate.
- 4.2.12 Fuel will be transported from the bunker onto each grate using an overhead crane. The fuel feed rate, the grate control and the primary air flows will be controlled to ensure that the fuel is completely burnt when it reaches the end of the grate. The ash will fall into a quench pit where it will be cooled and from there transported to the ash handling system.
- 4.2.13 Gases will flow upwards into the combustion chamber where 'secondary' air will be added in a controlled way to enhance mixing of the flue gas and ensuring all combustible gases are burnt.
- 4.2.14 The combustion system is automatically controlled to optimise the process efficiency and to control emissions. The control system uses a number of parameters to do this including gas temperature, oxygen content, steam flow, grate speed, fuel feed rate and air flows. In addition, the operator can override the automatic system if required based on operating experience and observation of plant performance.
- 4.2.15 Carbon monoxide and oxygen levels will be continuously monitored to ensure good combustion is maintained.
- 4.2.16 In the event that the residence time at the required temperature cannot be maintained, fuel would automatically be stopped from entering the combustion chamber until normal operating conditions are re-established.

Flue Gas Treatment Hall

- 4.2.17 A combination of primary combustion control measures and FGT will be used to control emissions to the limits set in the Environmental Permit and to meet national and international standards. A number of pollutants may be present in the flue gas that will require treatment and control, as outlined below.
- 4.2.18 Nitrogen oxides (NO_x) emissions are controlled through primary means including burner design and optimisation. However, additional secondary removal is likely to be required, using either Selective Non-Catalytic Reduction (SNCR) or Selective Catalytic Reduction (SCR) techniques. Both involve the controlled addition of ammonia or urea.
- 4.2.19 Acid gases produced during the combustion process will be removed by a scrubbing system, typically using hydrated lime as a reagent. Activated carbon will also be injected into the flue gas duct to minimise the emissions of dioxins, mercury, and other heavy metals.
- 4.2.20 After mixing with the flue gas treatment reagents, the gases will be drawn through a bag filter to remove particulates, including the added lime and activated carbon particles. Regular bag filter cleaning will be performed on-line by pulsing compressed air through the filter bags. The residues will be collected in fully enclosed hoppers beneath the filters.
- 4.2.21 Following cleaning, the gases from the combustion process will be released into the atmosphere via the gas flue within the stack(s).

Turbine Hall (including steam and heat export potential)

- 4.2.22 The Proposed Development design includes a steam turbine serving both streams. The Proposed Development will be capable of generating up to 95 MW of electricity from the

steam turbine, although some of the electricity generated will be used to meet the parasitic load within the plant.

- 4.2.23 The Proposed Development will be configured to enable heat (steam or hot water) to be exported to nearby consumers via an extraction from the steam turbine (i.e. the Proposed Development will be CHP Ready).

Administration Block

- 4.2.24 The administration block will be located in the main building and will contain the main reception, offices, control room, workshop, stores, electrical equipment and staff welfare facilities.

Cooling System

- 4.2.25 There are a number of different cooling options available for energy from waste plants (see Chapter 6: Alternatives and Design Development). The Proposed Development will use an ACC to condense the turbine exhaust steam. The ACC will consist of fans housed within a frame of fin-tube walls, all supported above the ground by a steel structure. The steam will be condensed by passing through the finned tubes cooled by ambient air.
- 4.2.26 The ACC will be located outside the main building.

Emissions Stacks

- 4.2.27 Up to two stacks each approximately 100 m in height (i.e. with the top of the stacks at 102 m Above Ordnance Datum (m AOD)) will be constructed on the eastern side of the main building adjacent to the FGT hall. Flue gases will be emitted from the stacks at approximately 120°C. Detailed air dispersion modelling has been carried out to inform the stack height and the EIA as discussed in Chapter 7: Air Quality and presented in detail in Appendix 7A in PEI Report Volume III.
- 4.2.28 Emissions from the stacks will be monitored continuously using Continuous Emission Monitoring Systems (CEMS), an automatic computerised system, and reported in accordance with the Environment Agency's requirements for the operation of the Proposed Development under an Environmental Permit.
- 4.2.29 The stacks will be fitted with aviation warning lights as required by the Civil Aviation Authority.

By-product Handling and Disposal

- 4.2.30 Two types of solid by-products and one type of liquid by-product (listed below) will be produced from the operation of the facility, each of which will have separate handling and disposal arrangements:
- incinerator bottom ash;
 - FGT residues; and
 - periodic liquid effluent from the boiler water treatment system and boiler blow-down.
- 4.2.31 Incinerator bottom ash is the burnt-out residue from the combustion process. The bottom ash will be discharged from the boiler to a bottom ash bunker for storage. Bottom ash will either be landfilled or recycled off-site as an aggregate.
- 4.2.32 As a worst case, based on a fuel NCV of 9 MJ/kg the facility would generate approximately 179,000 tonnes per annum (tpa) of wet (i.e. quenched) bottom ash which will need to be collected for disposal. Ferrous metals may be removed from the bottom ash by means of magnetic separators and discharged to a separate storage area for recycling.

- 4.2.33 FGT residues comprise fine particles of ash and residues that are collected in the bag filters. It is estimated that the Proposed Development will generate approximately 20,600 tpa of FGT residue. The FGT residue will be stored in sealed silos adjacent to the FGT plant. Due to the alkaline nature of the FGT residues, they are classified as a hazardous material. As a result, the residues will be transported by road in a sealed tanker to an appropriate treatment facility.
- 4.2.34 Liquid effluent will be produced from the boiler water treatment system and from the boiler blow-down. This liquid effluent will be fed to the ash discharger via the process water system. Under normal operating conditions, no effluents will require disposal as they will be returned into the process for re-use. In this way, the majority of liquid effluent produced on Site will either be evaporated or absorbed into the ash for transport off Site. Any excess liquid effluent, including arisings from boiler maintenance activities, will be collected on Site, analysed and transported off Site for treatment, or alternatively discharged to foul sewer under the conditions specified in the Environmental Permit and trade effluent agreement.

Access, Weighbridges, Gatehouse, Internal Roadways and Parking

- 4.2.35 The Site will be accessed from the A180 via the A1173, Kiln Lane, Hobson Way and a new access from South Marsh Road to the east of the existing SHBPS entrance as shown on Figure 4.1 in PEI Report Volume II.
- 4.2.36 The Main Development Area is currently crossed by an internal access road which links the SHBPS to the cooling water pumping station to the east of the Site. The Proposed Development will maintain access to the pumping station for SHBPS via a redirected roadway.
- 4.2.37 The Proposed Development has been designed to minimise conflict between HGVs and smaller vehicles, to reduce queue length and prevent delays to employees and visitors accessing the Site. HGV holding areas within the Site will avoid delivery HGVs queuing onto the public highway.
- 4.2.38 Internal roadways will be hard surfaced with appropriate drainage systems to manage surface water runoff and pollution risk.
- 4.2.39 After entering the Site, incoming HGVs will proceed via the gatehouse to the incoming weighbridges where the quantity of fuel will be checked, weighed and recorded. Vehicle loads will be systematically inspected at the weighbridge to confirm the nature of incoming fuel and only authorised fuel will proceed to the fuel reception area. Radioactivity detection will be installed to monitor incoming fuel at the entrance to the Site. Non-compliant waste will be quarantined and addressed separately.
- 4.2.40 After tipping fuel into the bunker and prior to exiting the Site, the weight of the outgoing vehicles will be recorded on separate outgoing weighbridges.
- 4.2.41 Up to 57 car parking spaces, including approximately five electric vehicle charging bays, and a bicycle shelter will be provided on the Site as shown on Figure 4.1 in PEI Report Volume II.

Substation and Electrical Connections

- 4.2.42 Electricity will be exported either to the National Grid Electrical Transmission (NGET) 400 kV system at the SHBPS 400 kV substation (located within the Site), or to the Northern Powergrid 132 kV local distribution network (located off Site).
- 4.2.43 Connection to the NGET system at the 400 kV substation would require 400 kV underground electrical cables and control system cables from a new transformer compound.

- 4.2.44 Connection to the 132 kV local distribution network would require an on Site substation which is included in the layout for the Proposed Development (see Figure 4.1 in PEI Report Volume II). This substation would be connected to the local distribution network at a 132 kV tower approximately 2 km to the west of the Site. It is anticipated that the route to the 132 kV tower would follow South Marsh Road.
- 4.2.45 Electrical connection works outside of the Site, if required, do not form part of the Proposed Development, and the relevant undertaker will rely either on their statutory powers or obtain the relevant consents prior to connection. Any such works have been considered in Chapter 17: Cumulative and Combined Effects.

Potential Gas Connection

- 4.2.46 Natural gas may be required at the Proposed Development as auxiliary fuel for start-up of the combustion process and combustion stabilisation. The gas supply would be connected via a pipeline to either the National Grid gas network or the Cadent Gas local distribution network.
- 4.2.47 Connection to the National Grid gas network would be at the location of the adjacent SHBPS Above Ground Installation (AGI) or to the SHBPS gas supply pipework, both located within the Site.
- 4.2.48 Gas connection works outside of the Site, if required to connect to the local distribution network, do not form part of the Proposed Development, and the relevant undertaker will rely either on their statutory powers or obtain the relevant consents prior to connection. Any such works have been considered in Chapter 17: Cumulative and Combined Effects.

Storage Tanks and Silos

- 4.2.49 Various tanks and silos will be required for the storage of materials such as the following:
- FGT reagents and residues;
 - auxiliary fuel (distillate) (if natural gas is not to be used);
 - firewater and treated towns main water; and
 - water treatment chemicals.

Auxiliary Generators

- 4.2.50 Auxiliary generators will be required to ensure power is available in the event of fuel supply interruption and power failure to the Site and to enable controlled shut-down of the plant in such a scenario. The capacity of these generators is expected to be relatively small, up to 9 MW, and will only be required as backup during a power failure on Site.

Surface Water Drainage

- 4.2.51 An Outline Drainage Strategy is presented within Appendix 14B in PEI Report Volume III. Surface water runoff will be drained and attenuated within the Site and discharged at 'greenfield' runoff rate to one of the two existing land drains within the Site.
- 4.2.52 Oil/ water separators will be provided where necessary.
- 4.2.53 Water required for the operation of the Proposed Development is expected to be obtained from an Anglian Water towns main connection.
- 4.2.54 Foul water will be discharged to the mains sewer or stored for tankering off Site.

HGV holding area and driver welfare facilities

- 4.2.55 A holding area will be provided between the Site entrance and the incoming weighbridge with welfare facilities for delivery drivers.

Landscaping and Biodiversity Mitigation and Enhancement Measures

- 4.2.56 Figure 4.2 in PEI Report Volume II presents indicative areas proposed for ecological mitigation and enhancement. This is discussed in more detail in Chapter 10: Ecology and Nature Conservation Section 10.7 Mitigation and Enhancement Measures.
- 4.2.57 Hard landscaping will also be provided within the Site where appropriate.

Combined Heat and Power (CHP) Readiness

- 4.2.58 In accordance with Environment Agency guidance, opportunities for the use of CHP from the Proposed Development are being considered and the Proposed Development has been designed to be CHP Ready in the event that no immediate CHP opportunities can be identified.
- 4.2.59 A review of potential heat demand within a 15 km radius of the Proposed Development is being undertaken and a CHP assessment report will be submitted with the Application.

4.3 Design Parameters

- 4.3.1 The design of the Proposed Development is iterative and may change as the EIA process progresses. However the design parameters defined within the Planning Permission will be retained in order to allow construction of the Consented Development to progress from Q1 2020. The changes that have been made to the Proposed Development to date are outlined in more detail in Chapter 6: Alternatives and Design Evolution.
- 4.3.2 A number of the design aspects and features of the Proposed Development cannot be confirmed until the EPC construction contractor has been appointed. For example, the building sizes may vary depending on the contractor selected and their specific configuration and selection of plant. Focussed use of the Rochdale Envelope approach has therefore been adopted to define appropriate parameters for use in the EIA.
- 4.3.3 Table 4.1 sets out the maximum dimensions for the layout of the Proposed Development which have been used for the basis of the various technical assessments. Maximum parameters have been devised to enable the EIA to progress in the absence of the final design information and to enable the compilation of a robust assessment based on a reasonable and appropriate worst case option.
- 4.3.4 Existing ground levels at the Site are approximately 2 m AOD. Finished floor levels at the Site are expected to remain at approximately 2 m AOD, with the exception of the fuel reception hall which is anticipated to be raised to approximately 5.5 m AOD (with ramps for HGV access and egress) in order to reduce the depth of excavation required for the fuel storage bunker and thereby reduce the volume of excavated material that may require off-site disposal during construction.
- 4.3.5 There is a potential requirement for cut and fill during construction to improve the bearing capacity of the ground within the Main Development Area. This is outlined further in Chapter 5: Construction Programme and Management). The requirement will be determined by the contractor as part of the detailed design, but has been considered where relevant in the EIA (for example in terms of construction waste and traffic movements).

Table 4.1: Maximum design parameters

COMPONENT	DIMENSIONS
Main building maximum height	59 m AOD (including 2 m parapet wall on boiler house)
Main building maximum footprint	210 m x 110 m
Stack height	102 mAOD
Stack diameter	3 m per combustion stream
Bunker base maximum depth	-8 mAOD

4.3.6 Further information on limits of deviation will be provided in the draft Development Consent Order and described in the final ES.

4.4 Comparison of Consented Development and Proposed Development

4.4.1 For reference, in comparison to the Consented Development, the Proposed Development includes the following additional equipment and works, which are required to enable generation of up to 95 MW of electricity:

- a larger ACC, with an additional row of fans and heat exchangers compared to the Consented Development – this will allow a higher mass flow of steam to be sent to the steam turbine whilst maintaining the exhaust pressure and thereby increasing the amount of power generated;
- a greater installed cooling capacity for the generator – additional heat exchangers will be installed to the closed circuit cooling water system compared to the Consented Development to allow the generator to operate at an increased load and generate more power;
- an increased transformer capacity – depending on the adopted grid connection arrangement the capacity will be increased through an additional generator transformer operating in parallel with the Consented Development's proposed generator transformer (or a single larger generator transformer) or an additional circuit breaker may be installed. Both arrangements would allow generation up to 95 MW; and
- ancillary works – the above works will require additional ancillary works and operations compared to the Consented Development, such as new cabling or pipes, and commissioning to ensure that the apparatus has been correctly installed and will operate safely and as intended.

4.5 Proposed Development Operation

Start-Up and Shut-Down

- 4.5.1 The Proposed Development will be started and stopped automatically, but under the supervision of trained operators, using auxiliary fuel (distillate or gas) to reach safe combustion temperatures before any solid fuels are added. The flue gas cleaning system and emissions monitoring will be in operation before any solid fuel is added.
- 4.5.2 If the operator wishes to turn the process off, this will be carried out in a controlled manner by reversing the start-up process. Solid fuel feeding will be stopped, but the process will continue to operate to ensure that all material is burnt, and any flue gases are cleaned

out of the system. Air flows will be left on to allow the boiler to cool down before the process is fully shut off.

- 4.5.3 If any emergency condition is reached, or if a rapid shut down is required, the Proposed Development will stop automatically in a rapid manner. Fuel flows and air flows will be stopped instantly causing combustion to stop very quickly. This system is fully interlocked to prevent manual intervention unless it is safe to do so. The Proposed Development is also protected in case of a complete loss of power by auxiliary generator(s) and uninterrupted power supplies (UPSs).

Electrical

- 4.5.4 In normal operating conditions, the power requirements of the Proposed Development will be supplied by the steam turbine generator with the balance exported to the grid. In the event of a breakdown of the steam turbine generator the power for the Proposed Development will be supplied from the grid. Auxiliary generators will also be available for safe shut down of the Proposed Development in the event of a loss of grid connection. The auxiliary generators will be sized to allow the Proposed Development to start without grid connection if necessary.

Maintenance

- 4.5.5 Routine maintenance will be undertaken in accordance with maintenance manuals provided by the construction contractor.
- 4.5.6 It is expected that each boiler will be taken offline for maintenance each year. This work may include the following:
- internal inspection of the boiler, storage tanks and silos;
 - replacement of wear parts such as sections of the grate, refractory material and the filter bags that form part of the FGT system;
 - non-destructive testing and thickness checks of pressure parts such as the boiler tubes;
 - testing and inspection of lifting equipment;
 - calibration and testing of instrumentation;
 - cleaning of equipment such as the boiler internal surfaces and material handling systems; and
 - full replacement of lubricants.
- 4.5.7 Overall it is expected that annual maintenance outages will last for approximately three weeks in total. Depending on the extent of the works being undertaken the number of staff on Site may not increase. However, where the outage works cannot be undertaken by permanent members of staff the number of staff on any one day could increase by up to 20. During the annual outage operational deliveries to the Site would significantly reduce.
- 4.5.8 During an annual maintenance outage the majority of works will be undertaken within the building envelope. Where works are completed externally, they are likely to be minor in nature and not present an environmental risk above that presented during operation of the Proposed Development.
- 4.5.9 In addition to annual outages, it is expected that major outages will be required on a less frequent basis, for example, every five to six years. A major outage could be expected to last for up to five weeks, and up to 200 staff may be required on Site on any one day. During this time, operational deliveries to the Site would reduce. In addition to the works

associated with a typical annual outage (as listed above), the works during a major outage may include:

- replacement of boiler parts;
- internal inspection of the steam turbine and generator; and
- servicing of control valves, fans and pumps.

4.5.10 During a major outage it is likely that Abnormal Indivisible Loads (AILs) will be required for delivery of equipment such as major boiler parts. It is likely that there will be fewer than five AILs required during a major outage.

4.5.11 A major outage is also likely to require the use of a large crane, and the removal of sections of the building cladding.

Hazard Prevention and Emergency Planning

4.5.12 Measures to prevent the risks of fire, spillages or other potentially major incidents will be embedded in the design of the Proposed Development.

4.5.13 Measures to prevent the risks of fire include:

- design and construction in accordance with the National Fire Protection Association guidance, supplemented by British and European Standards where appropriate;
- measures to segregate, detect and suppress fires to reduce the risk of any fire spreading;
- installation of infrared cameras in the fuel bunker to track hot spots;
- encasement of steelwork (e.g. in fire boarding or concrete) and installation of localised sprinkler systems to protect the building structure in the event of a fire; and
- provision of a quarantine area for the safe storage of any delivery vehicles in the case of smouldering loads.

4.5.14 Measures to prevent spillages include:

- bunded or double-skinned storage areas for liquid chemicals;
- regular maintenance and Site housekeeping to reduce the likelihood of leakages and improve leakage detection;
- spill kits stored on Site; and
- installation of an appropriate drainage system including oil interceptors for road drainage.

4.5.15 Measures to prevent other potentially major incidents include:

- compliance with all relevant health, safety and environmental legislation;
- design, build and operation of the Proposed Development in accordance with good industry practice; and
- regular maintenance and inspections to reduce the risk of equipment failures.

4.5.16 A site specific Health and Safety Plan covering the works, commissioning and operation of the Proposed Development will be prepared to ensure compliance with relevant health and safety legislation.

4.5.17 A Site Emergency Plan will be developed to cover the Proposed Development in accordance with the Environmental Permit, which will include a fire strategy and appropriate training procedures.

- 4.5.18 Procedures will be in place to clearly outline the responsibilities, actions and communication channels for operational staff and personnel on how to deal with emergencies should they occur. Staff will also receive the level of training required for their role and position. This will include dealing with events such as fires, spillages, flooding etc. Such measures will be included in the site operating and management system and regulated by the Environment Agency through the Environmental Permit.

Process Inputs

- 4.5.19 The Proposed Development will use various raw materials during operation. Primarily these include hydrated lime, ammonium hydroxide or urea, activated carbon, water and fuel for auxiliary burners. Except for water (and potentially gas fuel for the auxiliary burners), these will be delivered to the facility in bulk transportation vehicles. The minimum on Site storage capacity will be set to reflect the process requirements and delivery capability.
- 4.5.20 In order to minimise the risks of contamination to process and surface water, all liquid chemicals stored on site will be kept in bunded controlled areas with a volume of 110% of stored capacity. Fuel oil will be held in a bunded storage tank.
- 4.5.21 Gas (if required) and potable water will be supplied via gas and towns main water connections respectively.

Demineralised Water Treatment Plant and Demineralised Water Storage Tanks

- 4.5.22 Towns main water will need to be treated on Site in a water treatment plant to demineralise it for use in the boiler and for other uses. Treated water will be stored in tank(s) prior to use.

External Lighting

- 4.5.23 Prior to the commissioning of the Proposed Development a detailed lighting scheme will be submitted to NELC for approval. The external lighting scheme will be designed in accordance with relevant standards, such as the *Guidance Notes for the Reduction of Obtrusive Light (2011)* published by the Institute of Lighting Engineers and/ or Chartered Institution Building Services Engineers (CIBSE) requirements – as appropriate.
- 4.5.24 The external lighting scheme will be designed to provide safe working conditions in all areas of the Site whilst reducing light pollution and the visual impact on the local environment. This is likely to be achieved by the use of luminaires that eliminate the upward escape of light.

Environmental Management

- 4.5.25 The Proposed Development will comply with the Industrial Emissions Directive (IED) under its Environmental Permit so that any impacts of emissions to air, soil, surface and groundwater, to the environment and human health will be minimised and avoided where possible.
- 4.5.26 The Site will be operated in line with appropriate standards and the operator will implement and maintain an Environment Management System (EMS) which will be certified to International Standards Organisation (ISO) 14001. The EMS will outline requirements and procedures required to ensure that the Site is operating to the appropriate standard.
- 4.5.27 Sampling and analysis of pollutants will be carried out where required including monitoring of exhaust emissions levels using CEMS prior to discharge from the stacks, in accordance with the Environmental Permit.

4.6 Hours of Operation

- 4.6.1 The Proposed Development will operate twenty four hours a day, seven days a week, with occasional offline periods for maintenance. Fuel will be delivered to the Site by road twenty-four hours a day, seven days a week (excluding Christmas Day, Boxing Day and New Year's Day).
- 4.6.2 The Proposed Development will have storage capacity for approximately four days of fuel, so that the facility can continue to operate if there are any short term supply issues.

4.7 HGV Movements

- 4.7.1 Operational traffic movements are detailed within the Transport Assessment (TA) (Appendix 9A in PEI Report Volume III). In summary it is anticipated that during the operational phase of the Proposed Development, total HGV movements at the Site will be around 312 in and 312 out per day. These figures include fuel (RDF) deliveries and movements associated with delivery of consumables and removal of waste products e.g. bottom ash and FGT residues.
- 4.7.2 Although fuel deliveries will be accepted twenty-four hours a day, it is expected that the majority of fuel deliveries will occur between 6am and 6pm, with a maximum of 44 deliveries in any one hour, and only approximately three deliveries per hour between 6pm and 6am. The transport, noise and air quality assessments consider the worst case traffic profile relevant to that topic.

4.8 Staffing

- 4.8.1 The Proposed Development will be operated and managed by suitably qualified and trained personnel. It is anticipated that a total of up to 56 staff will be employed.
- 4.8.2 It is estimated that staff arrivals to the Site will be spread over a 24 hour period and on a shift system.

4.9 Decommissioning

- 4.9.1 The Proposed Development is expected to have a design life of around 30 years. At the end of its design life it is expected that the Proposed Development may have some residual life remaining and the operational life may be extended.
- 4.9.2 At the end of its operating life, all above-ground equipment associated with the Proposed Development will be decommissioned and removed from the Site. Prior to removing the plant and equipment, all residues and operating chemicals will be cleaned out from the plant and disposed of in an appropriate manner.
- 4.9.3 The bulk of the plant and equipment will have some limited residual value as scrap or recyclable materials, and the contractor will be encouraged to use materials that could be recycled.
- 4.9.4 Prohibited materials such as asbestos, polychlorinated biphenyls (PCBs), ozone depleting substances and carcinogenic materials will not be allowed within the design of the Proposed Development, and other materials recognised to pose a risk to health (but which are not prohibited) will be subject to detailed risk assessment.
- 4.9.5 Prevention of contamination is a specific requirement of the Environmental Permit for the operation of the Proposed Development and therefore it is being designed such that it will not create any new areas of ground contamination or pathways to receptors as a result of construction or operation. Once the plant and equipment have been removed to ground level, it is expected that the hardstanding and sealed concrete areas will be left in place. Any areas of the Proposed Development that are below ground level will be backfilled to ground level to leave a levelled area.

- 4.9.6 A Decommissioning Plan (including Decommissioning Environmental Management Plan) will be produced and agreed with the Environment Agency as part of the Environmental Permitting and site surrender process. The Decommissioning Environmental Management Plan will consider in detail all potential environmental risks on the Site and contain guidance on how risks can be removed or mitigated. This will include details of how surface water drainage should be managed on the Site during the decommissioning and demolition.
- 4.9.7 The Decommissioning Plan will include an outline programme of works. It is anticipated that it would take up to a year to decommission the Site, with demolition following thereafter taking around two years to complete.
- 4.9.8 During decommissioning and demolition there will be a requirement for office, accommodation and welfare facilities.
- 4.9.9 Any demolition contractor would have a legal obligation to consider decommissioning and demolition under the Construction (Design and Management) Regulations 2015, or the equivalent prevailing legislation at that time.
- 4.9.10 Decommissioning activities will be conducted in accordance with the appropriate guidance and legislation at the time of the Proposed Development's closure. All decommissioning activities will be carried out in accordance with the waste hierarchy and materials and waste produced during decommissioning and demolition will be stored in segregated areas to maximise reuse and recycling. All materials that cannot be reused or recycled will be removed from the Site and transferred to suitably permitted waste recovery/ disposal facilities. It is anticipated that a large proportion of the materials resulting from the demolition will be recycled and a record will be kept to demonstrate that the maximum level of recycling and reuse has been achieved.
- 4.9.11 Upon completion of the decommissioning programme, including any remediation works that might be required, the Environment Agency will be invited to witness a post-decommissioning inspection by site staff. All records from the decommissioning process will be made available for inspection by the Environment Agency and other relevant statutory bodies, in accordance with the Environmental Permit requirements.

4.10 References

Environment Agency (2013) *CHP Ready Guidance for Combustion and Energy from Water Power Plants Note (V1.0)*. Environment Agency, Bristol.

The Institute of Lighting Professionals (2011) *Guidance Notes for the Reduction of Obtrusive Light (GNO1)*. ILP, Rugby.

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5.0 CONSTRUCTION PROGRAMME AND MANAGEMENT

5.1 Introduction

- 5.1.1 This chapter provides a summary of the proposed approach for the construction phase of the Proposed Development.
- 5.1.2 This includes information on construction programme and timings, and methods of working where available.
- 5.1.3 At this stage a detailed construction programme is not available, as this is normally determined by the Engineering, Procurement and Construction (EPC) contractor who has not yet been appointed. Notwithstanding this, the EPC contractor procurement process is currently being progressed for the Consented Development, which has added greater certainty to the anticipated duration of the construction period. Where construction details cannot be confirmed at this stage, worst case estimates have been made based on experience gained on similar developments and professional judgment.

5.2 Construction Programme Scenarios

Scenario 1

- 5.2.1 As described in Chapter 4: The Proposed Development, The most likely construction programme is currently anticipated to be the construction of the Consented Development pursuant to the Planning Permission starting in Quarter 1 (Q1) 2020 and taking approximately three years to complete, with the additional aspects of the Proposed Development being constructed approximately half way through the construction period for the Consented Development, subject to the grant of a Development Consent Order (DCO) (potentially beginning in Q3 2021).
- 5.2.2 In this scenario (Scenario 1), the Applicant would continue to obtain any necessary approvals for the Consented Development pursuant to conditions attached to the Planning Permission. The submission of information to discharge planning conditions attached to the Consented Development has already begun and it is anticipated that applications to discharge conditions regarding the approval of detailed design for the Consented Development will be submitted during Q1 2020.

Scenarios 2 and 3

- 5.2.3 The other potential construction programme scenarios that are considered for the purposes of this EIA in order to present a robust assessment of potential impacts are:
- Scenario 2: construction of the Proposed Development in a single circa three year construction phase commencing shortly after the DCO is granted (expected in Q3 2021) (with no construction of the Consented Development pursuant to the Planning Permission); and
 - Scenario 3: construction of the Proposed Development in a single circa three-year construction phase commencing up to five years after the DCO is granted, in Q3 2026 (again, with no construction of the Consented Development pursuant to the Planning Permission).
- 5.2.4 These three potential construction programme scenarios are illustrated in Table 5.1.
- 5.2.5 Each environmental assessment topic identifies and assesses the 'worst case' construction scenario from the three scenarios described above for that topic, where relevant. For some topics, there is no material difference between the three scenarios, as the start date has no bearing on the assessment of effects, and where this is the case



this is stated. If construction has commenced before the final ES is prepared, Scenarios 2 and 3 may be discounted.

Table 5.1: Potential construction programme scenarios (if DCO granted around Q3 2021)

SCENARIO	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Scenario 1 Start Q1 2020 (pursuant to Planning Permission).										
Scenario 2 Start shortly after DCO award.										
Scenario 3 Start five years after DCO award.										

- 5.2.6 It is common for much of the ground work, for example piling and pouring of concrete slabs, to be completed prior to the erection of any above ground structures. The erection of civil and structural components, such as cladding and external civil works usually continue whilst mechanical erection is ongoing. However, the detailed phasing of construction is the responsibility of the appointed EPC contractor and can vary considerably dependent on plant layout and procurement of key equipment.
- 5.2.7 An indicative programme of construction activity within the three year construction period is provided at Table 5.2.
- 5.2.8 As shown in Table 5.2, the construction activities required for the Proposed Development include mobilisation and enabling works, earthworks, civil construction works, mechanical erection of equipment, buildings and structures, cold commissioning and hot commissioning. If the additional components required for the Proposed Development are constructed as currently anticipated (namely, Scenario 1: commencing shortly after the DCO is granted, approximately midway through the construction of the Consented Development), then mobilisation, enabling works and earthworks will have already been completed and only the civil and mechanical works associated with the additional elements of the Proposed Development (see Section 4.4 of Chapter 4: The Proposed Development), followed by cold and hot commissioning of the Consented Development and the Proposed Development as a whole, are anticipated to be required under the DCO.

Table 5.2: Indicative construction activities programme

ACTIV- ITY	YEAR 1												YEAR 2												YEAR 3											
	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Site mobilis- ation																																				
Enabling works																																				
Earth- works and civils																																				
Mechani- cal erection																																				
Cold commiss- -ioning																																				
Hot commiss- -ioning																																				
Start of operation																																				

5.3 Construction Methods

Construction Equipment

- 5.3.1 For the purposes of the PEI Report and the environmental assessments that will be presented in the Environmental Statement (ES) (and in particular for the noise assessment presented in Chapter 8: Noise and Vibration), worst case estimates have been made of the types and numbers of plant and machinery likely to be used on the Site during the construction period. The estimates are based on professional judgment using experience gained on similar developments. Appendix 8C in PEI Report Volume III presents a list of the typical plant and equipment requirements during construction that have been assumed for the construction noise assessment.

Demolition

- 5.3.2 No demolition is required prior to construction commencing on Site.

Earthworks

- 5.3.3 Earthworks will be required to reprofile the Site. This will be necessary to prepare for foundations and remove or remediate unsuitable soils if required.
- 5.3.4 The appointed contractor may also express a preference to cut and fill the top layer (c. 2 m) of ground to improve the geotechnical condition of the ground. Should this be required it is estimated that a volume of approximately 160,000 m³ of spoil could be generated. Some of this could be reused on Site but as any significant land raising could have undesirable flood risk impacts (see Chapter 14: Flood Risk, Hydrology and Water Resources and Appendix 14A: Flood Risk Assessment) the bulk of the material will need to be removed off Site to a suitable waste facility. This has been considered when estimating peak construction traffic movements (see Chapter 9: Traffic and Transport) and construction waste (see Chapter 16: Waste Management).
- 5.3.5 Some spoil may need to be temporarily stored within the Site. If necessary, suitable measures will be put in place to prevent sediment runoff being washed off Site.
- 5.3.6 Soils will be managed in accordance with best practice and a Materials Management Plan (MMP) will be prepared to detail the procedures and measures to be taken to manage excavated materials. Measures for the management of any contaminated soils will also be set out in the Construction Environmental Management Plan (CEMP).

Construction Laydown Areas and Welfare Facilities

- 5.3.7 The proposed construction laydown areas, including storage, site offices, welfare facilities and car parking, will be located within the Site, but may include areas outside the Main Development Area.
- 5.3.8 Vegetation clearance, levelling and ground preparation works for these laydown areas will be required to provide a suitable surface material. This will be permeable as to allow uncontaminated rain water to percolate to ground, with suitably bunded locations identified as storage areas for any hazardous or polluting materials or chemicals to prevent pollution.

Erection of Buildings and Structures

- 5.3.9 Based on the expected ground conditions and the proximity of the Site to the Humber Estuary it is expected that piling will be required as a foundation for the main buildings. A Piling Risk Assessment will be undertaken in accordance with Environment Agency guidance to consider and mitigate the risks of causing new pollutant linkages and/ or worsening existing linkages with respect to risks to controlled waters during construction of the Proposed Development.

- 5.3.10 As set out in Chapter 8: Noise and Vibration and Chapter 10: Ecology and Nature Conservation, the piling method will also be designed to avoid disturbance to wintering waterbirds using nearby fields.

Construction of Utilities Connections

- 5.3.11 The Proposed Development will require a number of utilities connections potentially including electricity and gas connections, foul and surface water drainage connections, mains water and telecommunications. These connections will be provided by the relevant statutory undertaker and are considered where relevant in the assessment of cumulative effects (see Chapter 17: Cumulative and Combined Effects).
- 5.3.12 Within the Site, pipes and cables will be laid both above and below ground. Those laid below ground will require the excavation and backfilling of trenches.

Construction Staff

- 5.3.13 Based on professional judgment and the construction of similar developments), it is estimated that the construction workforce will peak at around 750 workers.
- 5.3.14 The peak of construction activity and associated construction related traffic movements is anticipated to be in the second year of the construction phase.
- 5.3.15 It is anticipated that construction staff will use the existing trunk road and local networks to travel to the Site. Further detail is presented in the Construction Traffic Management Plan, and Construction Worker Travel Plan of the Transport Assessment presented within Appendix 9A in PEI Report Volume III.

Construction Traffic and Site Access

- 5.3.16 Based on the anticipated peak construction workforce there will be an estimated peak of around 375 passenger vehicle one-way movements per day to Site.
- 5.3.17 Based on typical requirements for bulk deliveries during construction the estimated peak of deliveries will generate around 58 HGV one-way movements per day to Site.
- 5.3.18 In addition, if the top layer of soil is replaced for geotechnical ground improvement (see above), it is estimated that up to 160,000 m³ of material would need to be removed from Site. This activity would generate approximately 180 one-way additional HGV movements per day over a period of approximately three months in the first year of construction.
- 5.3.19 There are two potential access points for construction traffic entering the Site:
- access using the existing gate in the perimeter fence on South Marsh Road in the north-west of the Main Development Area; and
 - access using the proposed new access point from South Marsh Road in the north-east of the Main Development Area.

- 5.3.20 Construction traffic may also access the Main Development Area via the existing South Humber Bank Power Station site entrance if necessary.
- 5.3.21 All HGV construction traffic will access/ depart the Site via the A180, the A1173, Kiln Lane, Hobson Way and South Marsh Road.

Construction Working Hours

- 5.3.22 Construction working hours are expected to be between 07:00 and 19:00 Monday to Saturday. However, any concrete slip-forming activities e.g. for the fuel bunker, will need to be carried out continuously. Where this or any other on Site works are to be conducted

outside the core hours, they will comply with any restrictions agreed with the planning authorities, including in relation to control of noise and traffic.

Construction Lighting

- 5.3.23 Temporary construction lighting will be required at the Site to enable safe working in the hours of darkness. Any temporary construction lighting used at the Site will be arranged so that light spill outside of the Site is minimised to avoid disturbance to sensitive receptors, including ecological receptors.
- 5.3.24 At the detailed design stage, a detailed operational lighting scheme will be designed to control obtrusive light to suitable limits and could include the following mitigation measures as part of good lighting design practice:
- use of shields/ baffles/ shrouds to minimise source intensity and contribution to sky glow from upward lighting;
 - use of reflectors to redirect light back downward to desired work areas;
 - confining lighting to task areas; and
 - limiting the mounting height of lighting.

Construction Environmental Management Plan (CEMP)

- 5.3.25 Standard best practice mitigation measures that will be adopted during the construction phase have been taken into account in the EIA. Construction works will be undertaken in accordance with the environmental commitments identified in Chapters 7 to 16, and having regard to relevant legislation.
- 5.3.26 The purpose of the CEMP is:
- to ensure nuisance levels as a result of construction and operation activities are kept to a minimum;
 - to comply with regulatory requirements and environmental commitments;
 - to ensure procedures are put into place to minimise environmental effects during construction; and
 - to maximise potential environmental enhancements.
- 5.3.27 A Framework CEMP is provided at Appendix 5A.

Materials Management Plan (MMP)

- 5.3.28 Following the completion of a pre-construction ground investigation (see Chapter 15: Geology, Hydrogeology and Land Contamination) a MMP will be prepared alongside any earthworks/ excavation/ reclamation strategy. The MMP will detail the procedures and measures that will be taken to classify, track, store, dispose of and possibly re-use excavated materials that are expected to be encountered during the construction works.
- 5.3.29 The disposal of soil waste, contaminated or otherwise, to landfill sites will be minimised by reducing the overall quantities of waste generated during construction and by considering whether excavated material can, as an alternative to landfill, be beneficially utilised either on Site or on other sites (see Chapter 16: Waste Management).

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6.0 NEED, ALTERNATIVES AND DESIGN EVOLUTION

6.1 Introduction

- 6.1.1 This chapter of the Preliminary Environmental Information (PEI) Report sets out the alternatives that have been considered during the evolution of the Proposed Development and design process as presented in Chapter 4: The Proposed Development, up to this stage of statutory consultation.
- 6.1.2 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations') state that the Environmental Statement (and a PEI Report) should contain "*A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen, option, including a comparison of the environmental effects*" (Regulation 14(2)(e)). This chapter recognises and fulfils this requirement in respect of the Proposed Development.
- 6.1.3 On the matter of alternatives, National Policy Statement (NPS) EN-1 (DECC, 2011a) paragraphs 4.4.1 and 4.4.2 state that "*This NPS does not contain any general requirement to consider alternatives or to establish whether the proposed project represents the best option. However, applicants are obliged to include in their ES, as a matter of fact, information about the main alternatives they have studied. This should include an indication of the main reasons for the applicant's choice, taking into account the environmental, social and economic effects and including, where relevant, technical and commercial feasibility.*"
- 6.1.4 In this context, the consideration of alternatives and design evolution has been undertaken with the aim of avoiding and/ or reducing adverse environmental effects (following the mitigation hierarchy of avoid, reduce and, if possible, remedy), while maintaining operational efficiency and cost-effectiveness, and considering other relevant matters such as available land and planning policy.
- 6.1.5 The design of the Proposed Development may continue to evolve up to the point of the DCO application submission in response to consultation feedback and with reference to any ongoing surveys and technical studies, however the design parameters defined within the Planning Permission will be retained in order to allow construction of the Consented Development to progress from Q1 2020. The design will be further refined following the grant of any DCO if the decision is made to develop the Proposed Development, although any such changes will remain within the design parameters set by the DCO.

6.2 The Need for the Proposed Development

- 6.2.1 There is a substantial body of policy and evidence in support of the twin national needs for new low carbon energy generation facilities and waste management facilities, which is further reflected in local planning policy.
- 6.2.2 The need for new electricity generation capacity of all types is set out in government policy – the Overarching National Policy Statement for Energy (NPS EN-1) (Department of Energy and Climate Change, 2011a). This explains at paragraphs 2.2.16 - 2.2.19 that the Government is implementing a variety of reforms in order to promote investment to replace ageing coal-fired and nuclear power infrastructure with safe, secure, affordable and increasingly low carbon supplies of energy.

- 6.2.3 Paragraph 2.2.20 states that in order to manage the risks to achieving security of supply the UK needs sufficient electricity capacity to meet demand at all times including a safety margin of reserve capacity, reliable associated supply chains to meet demand as rises, and a diverse mix of technologies and fuels.
- 6.2.4 Part 3 of NPS EN-1 sets out why there is an urgent need for new electricity infrastructure, for reasons including meeting energy security and carbon reduction objectives, replacing closing generating capacity, increasing capacity to complement renewable supply and preparing for future rises in electricity demand.
- 6.2.5 Paragraph 3.3.11 explains that the more renewable generating capacity we have the more generation capacity we will require overall, to provide back-up at times when the availability of intermittent renewable sources (such as wind and solar) is low.
- 6.2.6 Paragraph 3.3.15 of NPS EN-1 states that the urgency at which new energy infrastructure should be brought forward is as soon as possible and certainly within the next 10-15 years (i.e. the period up to 2021 – 2025).
- 6.2.7 Paragraph 3.1.3 explains that the Planning Inspectorate should “*assess all applications for development consent for the types of infrastructure covered by the energy NPSs on the basis that the Government has demonstrated that there is a need for those types of infrastructure and that the scale and urgency of that need is as described for each of them in this Part*”.
- 6.2.8 Awareness of energy security has increased following the 9 August 2019 blackout and subsequent news reporting. This incident involved a total loss in generation of around 2,100 MW, more than double the capacity the National Grid currently holds in reserve under the Security and Quality of Supply Standards (SQSS) (Energy Emergencies Executive Committee, 2019), and causing a sudden drop in frequency. The National Grid: Electricity System Operator has since suggested a review of the SQSS to determine whether greater quantities of reserve capacity are needed while also balancing the costs and risks. This demonstrates the ongoing relevance of the reforms outlined in NPS EN-1.
- 6.2.9 The important role of energy from waste power stations in addressing these needs is outlined in paragraphs 3.4.3 – 3.4.5 of NPS EN-1. Energy from waste is a renewable form of generation, as the principal purpose of the combustion of waste is to reduce the amount of waste going to landfill in accordance with the Waste Hierarchy and to recover useful energy from that waste. The Waste Hierarchy derives from the Waste Directive as implemented by the Waste (England and Wales) Regulations 2011. This ranks waste management options according to what is best for the environment and minimising resource consumption. The first priority is the prevention of waste, then re-use, and then recycling. Energy recovery follows this, and finally, disposal. Energy recovery includes anaerobic digestion and (as in the Proposed Development) incineration with energy recovery. Accompanying guidance explains that for some forms of waste the hierarchy is different, so for example, low grade wood waste should undergo energy recovery in preference to recycling. The Proposed Development would support the Waste Hierarchy and divert waste from less preferable forms of management.
- 6.2.10 NPS EN-1 at paragraph 3.44 notes that energy from waste can provide ‘dispatchable’ power, constituting an important contribution to the security of UK electricity supplies and which becomes even more crucial as increasing levels of intermittent renewables are constructed. It is necessary to bring forward new renewable electricity generation projects as soon as possible, and the need for such projects is therefore urgent. The Proposed Development would make a material contribution towards that need, generating up to 95 MW, and would be brought into operation as soon as 2023.

- 6.2.11 The Proposed Development would furthermore meet an identified national need for waste management facilities. Based on current arisings and current operational capacity the UK has around 13 Mt/y of residual waste arisings (Environmental Services Association, 2018). The Environmental Services Association (2018) document identifies that landfills are closing more rapidly than anticipated, but the alternative residual waste infrastructure which will move them up the waste hierarchy (mainly energy from waste power stations) is not coming on stream quickly enough to replace them. It is predicted that there will be 8.5 Mt of residual waste with no destination by 2030, assuming current recycling rates, or 6 Mt with higher recycling rates. Some of this is currently exported: estimates put the amount of residual waste exported for energy recovery overseas at around 3.5 million tonnes per annum (Tolvik Consulting, 2018). The capacity of the Proposed Development equates to around one fifth of the current UK exports of residual waste, or one tenth of the predicted 6 Mt of spare residual waste. Furthermore, around one million tonnes of residual waste passes through the nearby Humber Ports each year, incurring shipping and onward transport mileage. The Proposed Development is well situated in relation to these supply networks.
- 6.2.12 The Proposed Development would also represent a modern and efficient addition to the UK stock of energy from waste power stations. It will be classed as an energy recovery facility with its performance complying with the R1 Energy Efficiency formula in Annex II of the Waste Framework Directive 2008/98/EC. The Proposed Development would, once consented and permitted, represent an 8% increase over the current England wide capacity permitted R1 rated facilities, measured by throughput (Environment Agency, 2019).
- 6.2.13 Policy 1 of the North East Lincolnshire Local Plan (North East Lincolnshire Council (NELC), 2018) forms the basis of the land allocations for Employment Areas in order to deliver 8,800 jobs and support growth within a number of sectors including renewables and energy. The Local Plan also recognises that there is a need to ensure that there are sufficient waste management facilities within the Borough to meet the requirements of the area. The accompanying text for Policy 49 'Restoration and aftercare – Waste' recognises that waste disposal through means such as landfill is the least desirable waste management option. The Proposed Development will be located on an existing employment area and will not have a negative impact on the existing use – the South Humber Bank Power Station (SHBPS) – and is located near to strategic roads whilst being well separated from residential areas.
- 6.2.14 There is, in conclusion, a clear and urgent national need for this type of infrastructure as set out in the energy NPSs. The Proposed Development is well located and will make effective use of a renewable resource, diverting waste from landfill or from export overseas while supporting energy security and diversification.
- 6.2.15 In identifying reasonable and relevant alternatives to study, as described in this chapter, regard has been had to their ability to meet these needs, as compared to the Proposed Development.

6.3 The 'Do Nothing' Scenario

- 6.3.1 A 'do nothing' scenario in which the Proposed Development does not proceed is the baseline against which the impacts of the Proposed Development will be compared within the EIA. The 'do nothing' scenario could comprise the development of the Consented Development only, or no development on the Site.
- 6.3.2 In relation to the first of these 'do nothing' scenarios, Chapters 7-16 of this PEI Report provides a comparison of the effects of the Proposed Development to the effects of the Consented Development. In the second 'do nothing' scenario, the environmental effects

of the Proposed Development as set out in this PEI Report would not occur, but the beneficial socio-economic effects would also not be realised nor would the need for an additional waste management facility (the Proposed Development) which comprises a form of renewable energy be met.

6.4 Alternative Sites

- 6.4.1 The Applicant chose the Site at the existing SHBPS for the Consented Development. Whilst no alternative sites were considered, careful consideration was given to the suitability of the Site and the location and layout for the Main Development Area (which is discussed further in Section 6.4 and 6.6). Central to informing this suitability assessment was the completion of an initial environmental appraisal via a desk based study, which identified key environmental sensitivities within and surrounding the Site.
- 6.4.2 Table 6.1 summarises these key environmental sensitivities and provides commentary on each of them.

Table 6.1: Summary of preliminary environmental appraisal

SENSITIVITY	DISTANCE	PRELIMINARY APPRAISAL CONCLUSION
Highways and access	Adjacent to Site	The Site has good access to the highway network which is likely to have sufficient capacity for the operational traffic. Assessment of cumulative traffic impacts with other committed developments required.
Proximity to residential receptors	Over 1 km to the west of the Main Development Area	The Main Development Area is a substantial distance from residential receptors and is largely screened from the west by the existing SHBPS. Emissions to air and noise effects are unlikely to be significant at residential receptors based on distance and prevailing wind directions.
Land use	The Site	The Site lies within operational land associated with the SHBPS and allocated in the Local Plan (NELC, 2018) as Existing Employment Area, and within the South Humber Industrial Investment Programme area promoted by the Greater Lincolnshire Local Enterprise Partnership and North East Lincolnshire Council.
Archaeological remains (non-designated assets)	Within the Site, but outside the Main Development Area	The Main Development Area was stripped during the construction of the SHBPS and any surviving remains would have been removed during this process.

SENSITIVITY	DISTANCE	PRELIMINARY APPRAISAL CONCLUSION
Proximity to designated nature conservation sites (Humber Estuary Site of Special Scientific Interest (SSSI), Special Area for Conservation (SAC), Special Protection Area (SPA) and Ramsar site)	Approximately 175 m to the east of the Main Development Area.	<p>Habitats Regulations Assessment process to be followed, including assessment of operational air emissions.</p> <p>Stack height to be set at suitable height to avoid significant adverse effects on designated sites.</p> <p>Noise disturbance to bird populations requires careful consideration and influences development layout on the Site.</p>
Flood risk	The Site is located within Flood Zone 3.	Flood Risk Assessment required to assess flood risk on and off Site and to inform design, although the Site is defended by existing and maintained flood defences.
Surface water features (Humber Estuary and ponds and ditches)	Within and immediately adjacent to the Site.	<p>No controlled waters or Water Framework Directive waterbodies are present on the Site. However, the Humber Estuary lies 175 m to the east of the Main Development Area.</p> <p>There are several ditches on Site. These need to be surveyed for ecological value/ protected species.</p> <p>Layout to avoid direct impacts on surface water features where possible, and design/ construction methods to avoid potential pollution of ditches, which discharge to the Humber Estuary.</p> <p>Water Framework Directive assessment is required.</p>
Potential for contaminated land due to former industrial land uses	On Site	Phase I Geo-environmental Study required.
Potential for cumulative effects with other committed developments	There are other committed developments within 1 km of the Site	Assessment of potential for cumulative effects with other committed developments required, including the South Humber Bank Link Road, South Humber Industrial Investments Programme and Strategic Ecological Mitigation sites.

- 6.4.3 Following the completion of the preliminary appraisal, the Site was considered to be suitable for an energy from waste development and the design of the Consented Development was progressed, taking into consideration the potential sensitivities outlined in Table 6.1.
- 6.4.4 As the design of the Consented Development progressed, preliminary environmental assessments were carried out. These informed the initial design and enabled early consideration of potential environmental impacts from the Consented Development location or layout that may have the potential to give rise to any significant environmental effects so that possible alternative solutions could be achieved. These preliminary assessments included:
- preliminary flood risk appraisal;
 - preliminary Habitats Regulations Assessment (including air dispersion modelling);
 - preliminary ecological appraisal; and
 - preliminary traffic and transport appraisal.
- 6.4.5 Taking the findings of the above into account, the Site, and specifically the Main Development Area, was selected for the Consented Development for the following reasons:
- the Main Development Area is currently undeveloped land within the boundary of the SHBPS;
 - the Site is also located within an existing industrial area with potential for off-site Combined Heat and Power opportunities;
 - the Site has excellent transport links with capacity on the surrounding network to accommodate construction and operational traffic associated with the Consented Development; and
 - the Site is in the freehold ownership of EP UK Investments Ltd.
- 6.4.6 , As the Proposed Development is, in effect, the Consented Development with additional infrastructure to increase the electrical output, necessarily located on the same Site as the Consented Development, no further consideration of the suitability of the site has been undertaken for the Proposed Development.

6.5 Alternative Locations within the Site

- 6.5.1 The location of the Main Development Area within the SHBPS site was kept as far away from the Humber Estuary designated nature conservation site as possible (located immediately to the east of the SHBPS main buildings), so as to minimise the risk of disturbance to that receptor. Alternative configurations of the layout within the Main Development Area were considered, and this is summarised within Section 6.6 below.

6.6 Alternative Technologies

- 6.6.1 The principal available technical alternatives considered were:
- conventional combustion – combustion of waste using grate or fluidised bed technologies followed by energy recovery using a steam turbine and electricity generator; or
 - advanced thermal treatment – including gasification, plasma gasification and pyrolysis followed by energy recovery by combustion of the syngas arising from the process.
- 6.6.2 Thermal treatment is assessed primarily on technical performance including minimising pollutant emissions to air and water and maximising energy recovery. In respect of

gasification/ pyrolysis and other advanced techniques, the available technologies do not currently demonstrate environmental benefits and may in some cases recover less energy than conventional combustion techniques. Conventional combustion using a grate was therefore considered optimal for the Proposed Development.

6.6.3 Other complementary technical options for the management and treatment of waste are listed below:

- anaerobic digestion – a biological process whereby organic waste (e.g. food or green waste) is biodegraded by naturally occurring bacteria in a sealed tank in the absence of oxygen. This process produces a 'biogas' and an organic residue called 'digestate'. The biogas is captured, and the methane is cleaned and can then be used in a variety of ways, including in a gas engine, to produce electricity and/or heat; compressed and used as a vehicle fuel; or injected into the national gas transmission system. The 'digestate' can potentially be used in a number of land applications (mainly farming but also restoration and landscaping) depending on its nutrient content and level of stability. However, its use is restricted when mixed wastes are used as an input due to the risk of contamination;
- Mechanical Biological Treatment (MBT) – a generic term for a combination of mechanical equipment (similar to that used in a materials recycling facility to physically separate different materials fractions) and some biological treatment element (aerobic with air or anaerobic without air to biodegrade or bio-dry the organic fraction of the waste); and
- mechanical pre-treatment – combines a number of screening/ mechanical sorting techniques to extract a small amount of additional recyclate from residual municipal waste. It should be noted that this recyclate will generally be of a lower quality than that collected during front end materials recycling and it is not intended to replace that system but to enhance recycling rates where necessary.

6.6.4 Non-thermal technologies such as anaerobic digestion and MBT are complimentary to rather than a replacement for thermal treatment since they can only treat the organic fraction of the waste, and the inorganic part (e.g. plastics) would require separate treatment. These complimentary technologies may be undertaken by fuel providers off Site, but do not form part of the Proposed Development (or the Consented Development).

6.6.5 Mechanical pre-treatment is suitable for extracting additional recyclable materials in waste prior to energy recovery using thermal treatment. The layout of the Proposed Development allows space for the potential future installation of a materials recovery facility (MRF) using mechanical pre-treatment so as to recover additional recyclables. However, this does not form part of the Proposed Development and is not currently proposed; if required this would be the subject of a separate consent in the future.

6.7 Consideration of Alternative Designs and Design Evolution

6.7.1 During the design of the Proposed Development to date, a number of design iterations and design alternatives have been considered to avoid, reduce and/ or remedy potential environmental effects and the proposed design has been consulted upon with relevant consultees (previously as part of the pre-application and application consultation for the Consented Development). As noted above at para [6.1.4], the design may continue to evolve in response to further consultation feedback and ongoing studies up until the submission of the DCO application.

6.7.2 Table 6.2 summarises the design iterations of note that have taken place to date and the reasons for the iteration, noting where the change related to reducing potential impacts on the environment or sensitive receptors, as required by the EIA Regulations.

Table 6.2: Summary of design evolution

DESCRIPTION OF DESIGN ELEMENT	SUMMARY OF OPTIONS CONSIDERED	COMPARISON OF ENVIRONMENTAL EFFECTS	OUTCOME
Operational Site access	<p>Various options for access were considered, including:</p> <ul style="list-style-type: none"> • access via the existing SHBPS entrance; and • a new dedicated access from South Marsh Road to the east of the SHBPS entrance (at various locations along the northern boundary of the Site). 	<p>Both access options would introduce additional traffic to South Marsh Road, but the new dedicated access would minimise disruption to the existing SHBPS's operation.</p> <p>A new dedicated access would require widening of an existing ditch culvert with potential for adverse effects on water vole and surface water quality during construction, but these can be mitigated by temporary pre-construction displacement of water voles from the working area (if any are present) and good construction practice to prevent surface water pollution.</p> <p>The position of the proposed new access has been identified with consideration of proximity to the existing SHBPS entrance and access to other neighbouring sites including Synthomer, NEWLINCS, farmland and Humber Estuary flood defences, to minimise the potential for disruption.</p>	A new access to be developed from South Marsh Road in the north-east of the Main Development Area, to minimise disruption to the SHBPS's operation.
Site layout	Various layouts have been considered throughout the design evolution of the Proposed Development to date, all of which located the Proposed Development away from the	Layouts that would not allow an offset between buildings and the ditches around the Site would require water voles to be translocated prior to construction, whereas layouts including a suitable offset would minimise effects on water vole and not require translocation.	The Proposed Development layout has been optimised to include a 5 m offset between ditches and buildings/ internal access roads (with the exception of the ditch crossing for the new site access, as described above), avoid siting buildings/ structures above the

DESCRIPTION OF DESIGN ELEMENT	SUMMARY OF OPTIONS CONSIDERED	COMPARISON OF ENVIRONMENTAL EFFECTS	OUTCOME
	<p>Humber Estuary so as to minimise the potential for effects on habitat.</p> <p>The various layouts have included different configurations for buildings, structures and internal access arrangements, with consideration of the need to:</p> <ul style="list-style-type: none"> • allow suitable offset distance from the ditches in the north and south of the Site to reduce impacts on water vole; • avoid siting buildings and structures above the SHBPS underground cooling water pipes where possible; • avoid occupied buildings being located within the Health and Safety Executive (HSE) Inner Zone around nearby hazardous installations; and • achieve operational functionality. 	<p>No potential layouts were developed that included workplaces accommodating more than 100 occupants or with three or more storeys within the HSE Inner Zone</p> <p>There are no notable differences in environmental effects between layouts in relation to the underground cooling water pipes, HSE consultation zones and operational functionality.</p>	<p>cooling water pipes where possible, avoid the administration/ office building being located in the HSE Inner Zone, and maximise operational functionality.</p>
Stack height	<p>Stack heights of 90 m and 100 m were considered with regards to the dispersion of air pollutants.</p>	<p>100 m stacks would provide better dispersion of air pollutants than 90 m stacks, avoiding potential for significant adverse effects on human or ecological receptors (including the Humber Estuary).</p> <p>100 m high stacks would have a slightly larger Zone of Theoretical Visibility (ZTV)</p>	<p>Following completion of the air dispersion modelling for the Consented Development stack heights of 100 m were identified as appropriate to mitigate significant environmental effects on sensitive ecological receptors.</p>

DESCRIPTION OF DESIGN ELEMENT	SUMMARY OF OPTIONS CONSIDERED	COMPARISON OF ENVIRONMENTAL EFFECTS	OUTCOME
		compared to 90 m stacks, although the landscape and visual effects would not be significantly different.	
Cooling technology	Water, hybrid and air cooling have been considered.	<p>Water and hybrid cooling technologies would have a large water demand (which air cooling would not). This would require upgrading of the existing SHBPS cooling water pumping station (potentially requiring works in the Humber Estuary, with corresponding potential effects on the habitat) and either an increase in the permitted abstraction volumes from the Estuary, or a new groundwater borehole and abstraction licence, both of which would have water resources implications.</p> <p>Air cooling technology would generate more noise than water cooling and is typically slightly less efficient.</p>	<p>Air cooling is considered to represent the Best Available Technique (BAT) for the Proposed Development because it would not affect water resources or directly affect the Humber Estuary and the slight loss of efficiency is minimal for the cooling demand of the Proposed Development.</p> <p>Air cooling therefore chosen as the cooling technology.</p>
Sizing of Proposed Development	<p>The size of the Proposed Development is a commercial consideration.</p> <p>One and two stream development options have been considered.</p> <p>The option to increase the efficiency of the plant by adding additional components to the Consented Development has also been considered since the Planning Permission was granted.</p>	<p>A two stream plant would have greater potential for significant adverse air quality, noise, traffic, ecology, landscape and visual amenity, and waste effects than a single stream plant (assuming that the size of a stream remains constant) due to the larger scale of operation, but a single stream plant would have less potential for significant beneficial socio-economic effects.</p> <p>The environmental effects of the Proposed Development are unlikely to be significantly different to the Consented</p>	<p>Planning Permission for the Consented Development with a fuel throughput of up to 753,000 tonnes per annum and electrical output of up to 49.9 MW was granted in April 2019.</p> <p>A single stream development has been discounted for commercial reasons.</p> <p>Development Consent for the Proposed Development with a fuel throughput of up to 753,000</p>

DESCRIPTION OF DESIGN ELEMENT	SUMMARY OF OPTIONS CONSIDERED	COMPARISON OF ENVIRONMENTAL EFFECTS	OUTCOME
		Development, as the development footprint, building scale and massing will be similar, and the fuel throughput and emissions will be the same to those assessed for the Consented Development, so the effects on air quality, noise, traffic, ecology, landscape and visual amenity, land contamination, water resources, flood risk and drainage, socio-economics and waste will be similar.	tonnes per annum and electrical output of up to 95 MW will now be sought. In general the maximum size of the Proposed Development is assessed as this represents the 'worst case' in terms of environmental impacts.
Potential phasing of the Proposed Development	For commercial reasons, the possibility of a two stream development being built in two phases, or a single stream development was considered.	As for the discussion above regarding the size of the Proposed Development, assuming that the size of a stream remains constant, a single stream development would potentially have less air quality, noise, traffic, ecology, landscape and visual and waste effects but also lesser beneficial socio-economic effects. Constructing the two stream development in a single phase would generate slightly increased potential for air quality, noise and traffic effects during construction. Constructing a two-stream development in two phases would increase the duration of construction effects and disturbance.	As described above, a single stream development has been discounted for commercial reasons. Two-phase construction has also been discounted for commercial reasons, although three construction programme scenarios (Scenario 1, Scenario 2 and Scenario 3) are being considered by the EIA (see Chapter 5: Construction Programme and Management), with the 'worst case' identified and assessed for each topic.
Design of fuel bunker	The base of the fuel bunker will be around 10 m lower than the internal floor level in the fuel reception hall, to provide sufficient capacity in the fuel bunker and	Some of the excavation material arising from excavation of the fuel bunker to - 8 m AOD would need to be exported from the Site, as any significant land raising could have undesirable flood risk impacts.	Both options (excavation of the fuel bunker up to -8 m AOD with the fuel reception hall floor level around 2 m AOD, and excavation of the fuel bunker to around -4.5 m

DESCRIPTION OF DESIGN ELEMENT	SUMMARY OF OPTIONS CONSIDERED	COMPARISON OF ENVIRONMENTAL EFFECTS	OUTCOME
	<p>enable delivery vehicles to tip fuel into the bunker. This could be achieved by excavating the base of the fuel bunker to around -8 m Above Ordnance Datum (AOD) (assuming a ground level of around 2 m AOD), or by raising the internal floor level of the fuel reception hall to around 5.5 m AOD to reduce the fuel bunker excavation depth to around -4.5 m AOD (with ramps on embankments for access and egress).</p> <p>The dimensions of the fuel reception hall building would not vary between these options.</p>	<p>If the depth of the fuel bunker below ground was reduced, this would improve the cut and fill balance and it is estimated that the corresponding reduction in excavation arisings would reduce construction traffic by around 1,000 HGV movements.</p> <p>The other potential differences in environmental effects between these options are on visual receptors (due to the potential use of ramps) and ecological noise receptors (due to HGV traffic noise affecting birds in fields to the north and south of the Main Development Area), but following visual appraisal and noise modelling it has been concluded that there is no significant difference in effects between the options.</p> <p>There are no other notable differences in environmental effects between the fuel bunker design options.</p>	<p>AOD with the fuel reception hall floor level around 5.5 m AOD) remain open and are being assessed in the EIA where relevant.</p>

6.8 Conclusions

- 6.8.1 As part of the selection of the SHBPS site as the preferred site for the Consented Development, consideration of alternative technologies, and design evolution process, consideration and comparison of environmental effects have been a factor at each stage.
- 6.8.2 The form and approach to the Proposed Development has been identified as above at this stage in the EIA process, taking into account environmental effects, alongside other factors such as technical and commercial feasibility. The design may continue to evolve following consultation and the final design will be reported in the ES submitted as part of the Application.

6.9 References

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7.0 AIR QUALITY

7.1 Introduction

- 7.1.1 This chapter of the Preliminary Environmental Information (PEI) Report addresses the potential effects of the Proposed Development on air quality. Emissions associated with combustion plant have the potential to affect human health and sensitive ecosystems, and construction could give rise to potential localised air quality effects from traffic and dust generation if not appropriately managed. This chapter describes the potential environmental effects, including those that are likely to be significant associated with releases to atmosphere during the construction, operation (including maintenance), and decommissioning phases of the Proposed Development.
- 7.1.2 The assessment considers:
- the potential for particulate matter (dust deposition and PM₁₀ size fractions, which is particulate matter of 10 µm diameter or less) related amenity issues to arise during construction and decommissioning;
 - the effects on air quality from traffic movements related to the construction and decommissioning of the Proposed Development;
 - the effects from the Proposed Development during operation, with consideration of potential impacts at sensitive human receptors;
 - identification of suitable stack heights that avoid likely significant effects to air quality at identified sensitive resources/ receptors;
 - the effects on air quality from traffic movements related to the operation of the Proposed Development; and
 - the potential for particulate matter (dust deposition and PM₁₀ size fractions) and odour emissions to give rise to amenity effects during operation of the Proposed Development.
- 7.1.3 The detailed dispersion modelling of impacts due to emissions to air from the stacks and other emission sources is presented in detail within a separate technical air quality impact assessment report (Appendix 7A in PEI Report Volume III). This chapter refers to the technical report where required to provide quantitative evidence of the baseline and predicted magnitude of changes in pollutant concentrations, based on conservative assumptions.
- 7.1.4 This chapter is supported by Figures 7.1 to Figure 7.4 in PEI Report Volume II, Appendix 7A (PEI Report Volume III) which details the dispersion modelling undertaken.
- 7.1.5 The impact on designated nature conservation sites associated with emissions from the Proposed Development has been modelled and considered as part of this initial air quality assessment. The significance of the predicted effects is also discussed within Chapter 10: Ecology and Nature Conservation.
- 7.1.6 The potential for significant cumulative effects of stack sources and road traffic sources is discussed in Chapter 17: Cumulative and Combined Effects.

7.2 Legislation and Planning Policy Context

Legislative Background

Air Quality Legislation

- 7.2.1 The principal air quality legislation within the United Kingdom is the Air Quality Standards Regulations 2010 ('the 2010 Regulations'), which transposes the requirements of the European Ambient Air Quality Directive 2008 and the 2004 fourth Air Quality Daughter Directive. The 2010 Regulations set air quality limits for a number of major air pollutants that have the potential to impact public health, such as nitrogen dioxide (NO₂), sulphur dioxide (SO₂), carbon monoxide (CO) and particulate matter (PM₁₀). The 2010 Regulations also include an exposure reduction objective for PM_{2.5} in urban areas and a national target value for PM_{2.5} (PM_{2.5} is particulate matter of 2.5µm diameter or less).
- 7.2.2 The Environment Act 1995 requires the UK Government to produce a National Air Quality Strategy (NAQS), set out in 2011 (Department for Environment, Food and Rural Affairs (Defra), 2011)) and most recently reviewed in the 2019 Clean Air Strategy (Defra, 2019a), containing air quality objectives and timescales to meet those objectives. These objectives apply to outdoor locations where people are regularly present and do not apply to occupational, indoor or in-vehicle exposure. The objectives that are applicable to this assessment are set out in Table 7.1 in relation to human health, and Table 7.2 in relation to ecological sites.

Table 7.1: Air Quality Strategy Objectives (NAQS) - protection of human health

POLLUTANT	SOURCE	CONCENTRATION (µg/m ³)	MEASURED AS
NO ₂	EU Air Quality Limit Values	40	Annual mean
		200	1-hour mean, not to be exceeded more than 18 times per year
PM ₁₀	EU Air Quality Limit Values	40	Annual Mean
		50	24-hour mean, not to be exceeded more than 35 times a year
PM _{2.5}	EU Air Quality Limit Values	25	Annual mean
SO ₂	UK Air Quality Strategy Objective	266	15-min mean, not be exceeded more than 35 times a year
	EU Air Quality Limit Values	350	1-hour mean, not to be exceeded more than 24-times a year
	EU Air Quality Limit Values	125	24-hour mean, not to be exceeded more than 3 times a year
Benzene	UK Air Quality Strategy Objectives	16.25	Running annual mean
	EU Air Quality Limit Values	5	Annual mean
CO	EU Air Quality Limit Values	10,000	Maximum daily running 8-hour mean

POLLUTANT	SOURCE	CONCENTRATION ($\mu\text{g}/\text{m}^3$)	MEASURED AS
PAH, as BaP	EU Air Quality Target Value	0.001	Annual mean
	UK Air Quality Strategy Objectives	0.00025	Annual mean
Pb	EU Air Quality Limit Values	0.5	Annual mean
	UK Air Quality Strategy Objectives	0.25	Annual mean
As	EU Air Quality Target Values	0.006	Annual mean
Cd	EU Air Quality Limit Values	0.005	Annual mean

Table 7.2: Critical Levels for the protection of vegetation and ecosystems

POLLUTANT	SOURCE	CONCENTRATION ($\mu\text{g}/\text{m}^3$)	MEASURED AS	NOTES
NH ₃	Environmental Agency Environmental Permit Guidance	1	Annual mean	For sensitive lichen communities & bryophytes and ecosystems where lichens and bryophytes are an important part of the ecosystem's integrity
		3	Annual mean	For all higher plants (all other ecosystems)
SO ₂	Environmental Agency Environmental Permit Guidance	10	Annual mean	For sensitive lichen communities & bryophytes and ecosystems where lichens and bryophytes are an important part of the ecosystem's integrity
		20	Annual mean	For all higher plants (all other ecosystems)
NO _x (as NO ₂)	Environmental Agency Environmental Permit Guidance	30	Annual mean	-
		75	Daily mean	-
HF	Environmental Agency Environmental Permit Guidance	<5	Daily mean	-
		<0.5	Weekly mean	-

7.2.3 The Environment Act requires local authorities to undertake an assessment of local air quality to establish whether the objectives are being achieved, and to designate Air Quality Management Areas (AQMAs) if improvements are necessary to meet the objectives. Where an AQMA has been designated, the local authority must draw up an Air Quality Action Plan (AQAP) describing the measures that will be put in place to assist in achieving the objectives. Defra has responsibility for coordinating assessments and AQAPs for the UK as a whole.

7.2.4 No AQMAs have been declared for the Site or surrounding areas (the nearest being 5.2 km to the south-east of the Site) and based on Defra forecast models and local authority monitoring data, no exceedances of the EU standards have been identified in the vicinity of the Site, as the air quality is generally good.

Environmental Permitting Regulations

7.2.5 The Environmental Permitting (England and Wales) Regulations 2016 (EPR) apply to new and existing installations that fall under the regime and transpose the requirements of the EU Industrial Emissions Directive (IED) into UK legislation. Under the IED and EPR, the operator of an installation covered by the IED is required to employ Best Available Techniques (BAT) for the prevention or minimisation of emissions to the environment, to ensure a high level of protection of the environment as a whole.

Industrial Emissions Directive

7.2.6 The Integrated Pollution Prevention Control Reference Document on the Best Available Techniques for Waste Incineration (BREF) (European Commission (EC), 2006) provides operational limits and controls to which plants must comply. The Proposed Development will be regulated under the Industrial Emissions Directive (IED) and in accordance with the waste incineration BREF. Consideration has also been given to the revised draft of the waste incineration BREF (version D1, published December 2018) and the BAT conclusions within it; while these are only draft at this stage it is envisaged that these conclusions will largely apply in the final version of the revised BREF. At this point, the recommendations of the BREF will become enforceable through Environmental Permits and the Environment Agency (EA) would set specific limits on the Environmental Permit based on the BAT-associated emission levels (BAT-AELs).

7.2.7 The design of the flue gas treatment system will be fully compliant with current legislation, meeting the requirements of BAT as well as the EA guidance on risk assessment for environmental permits and the IED. In accordance with Article 15, paragraph 2, of the IED, the emission limits that the Proposed Development will be designed to meet are based on BAT. BAT-AELs are included in the draft waste incineration BREF currently under review and these have been applied in the air impact assessment accordingly.

Sensitive Ecosystems

7.2.8 The UK is bound by the terms of the European Birds and Habitats Directives and the Ramsar Convention. The Conservation of Habitats and Species Regulations 2017 ('the 2017 Regulations') provide for the protection of European Sites created under these, i.e. Special Areas of Conservation (SACs) designated pursuant to the Habitats Directive, and Special Protection Areas (SPAs) and provisional SPAs (pSPAs) classified under the Birds Directive. The 2017 Regulations apply specific provisions of the European Directives to SACs, and candidate SACs (cSACs), which requires these sites to be given special consideration, and for further assessment to be undertaken for any development which is likely to lead to a significant effect upon them (see Regulation 63). Special consideration within this chapter has also been given to SPAs, pSPAs and Ramsar sites designated as wetlands of international importance.

- 7.2.9 The legislation concerning the protection and management of designated sites and protected species within England is set out within the provisions of the 2010 Regulations, the Wildlife and Countryside Act 1981 (as amended) and the Countryside and Rights of Way Act 2000 (as amended).

Planning Policy Context

National Planning Policy

- 7.2.10 National Policy Statements (NPS) are, where in place, the primary basis for the assessment and determination of applications for nationally significant infrastructure projects (NSIPs), such as the Proposed Development. The Overarching National Policy Statement (NPS) for Energy EN-1 (Department of Energy and Climate Change, 2011a) and the National Policy Statement for Renewable Energy Infrastructure EN-3 (Department of Energy and Climate Change, 2011b) are relevant to the Proposed Development.

- 7.2.11 NPS EN-1 states that:

“The planning and pollution control systems are separate but complementary. The planning system controls the development and use of land in the public interest...Pollution control is concerned with preventing pollution through the use of measures to prohibit or limit the releases of substances to the environment from different sources to the lowest practicable level. It also ensures that ambient air and water quality meet standards that guard against impacts to the environment or human health.

In considering an application for development consent, the IPC [Secretary of State] should focus on whether the development itself is an acceptable use of the land, and on the impacts of that use, rather than the control of processes, emissions or discharges themselves. The IPC should work on the assumption that the relevant pollution control regime and other environmental regulatory regimes...will be properly applied and enforced by the relevant regulator” (paragraphs 4.10.2-4.10.3).

- 7.2.12 EN-1 requires the consideration of significant air emissions, their mitigation and any residual effects, the predicted absolute emission levels after application of mitigation, the relative change in air quality from existing concentrations and any potential eutrophication impacts as a result of the Proposed Development project stages, including contributions from additional road traffic. Where a project could result in deterioration in air quality in an area where national air quality limits are not being met, or may lead to a new area breaching national air quality limits, or where substantial changes in air quality concentrations are predicted, such effects would be expected to be given substantial weight in consideration of the acceptability of the proposal. Where a project is likely to lead to a breach of statutory air quality limits the developer should work with the relevant authorities to secure appropriate mitigation measures to allow the proposal to proceed.

- 7.2.13 The revised National Planning Policy Framework (NPPF) (Ministry of Housing, Communities & Local Government, 2019) concisely sets out national policies and principles on land use planning. Paragraph 103 of the NPPF states that:

“The planning system should actively manage patterns of growth in support of these objectives. Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health.”

- 7.2.14 Air quality is considered as an important element of the natural environment. Air quality in the UK has been managed through the Local Air Quality Management regime using national objectives. The different roles of a planning authority and a pollution control authority are addressed by the NPPF in paragraph 183:

“The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.”

7.2.15 The Planning Practice Guidance (PPG) was updated on 24 July 2018 (Ministry of Housing, Communities & Local Government, 2018b), with specific reference to air quality, which was published on 6 March 2014. The PPG states that the planning system should consider the potential effect of new developments on air quality where relevant limits have been exceeded or are near the limit. Concerns also arise where the development is likely to adversely affect the implementation of air quality strategies and action plans and/ or, in particular, lead to a breach of EU legislation (including that applicable to wildlife). In addition dust can also be a planning concern, for example, because of the effect on local amenity.

7.2.16 When deciding whether air quality is relevant to a planning application the PPG states that a number of factors should be taken into consideration including if the development will:

- *“Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; adds to turnover in a large car park; or result in construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more.*
- *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area;*
- *Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.*
- *Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations.*
- *Affect biodiversity. In particular, is it likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site, and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites.”*

7.2.17 Regarding how detailed an air quality assessment needs to be, the PPG states:

“Assessments should be proportionate to the nature and scale of the development proposed and the level of concern about air quality... Mitigation options where necessary will be locally specific, will depend on the proposed development and should be proportionate to the likely impact. It is important therefore that local planning authorities work with applicants to consider appropriate mitigation so as to ensure the new development is appropriate for its location and unacceptable risks are prevented.”

Local Planning Policy

7.2.18 The recently adopted North East Lincolnshire Local Plan 2013 to 2032 (adopted 2018) was considered where relevant during the completion of the air quality assessment.

Other Guidance

7.2.19 The EA Risk Assessments for Specific Activities: Environmental Permits guidance (Defra and EA, 2018d) provides guidance on the assessment of BAT and of impacts from permitted installations, primarily for the purposes of Environmental Permitting. As part of this, the guidance includes objective values set out in regulations as part of the NAQS Objective values (national objective values), as well as criteria values for a range of other substances not included in regulations. The criteria used in this assessment are set out in Table 7.1 and Table 7.2 above and Table 7.3 below.

Table 7.3: Environmental assessment levels (Environment Standards) – protection of human health

POLLUTANT	SOURCE	CONCENTRATION ($\mu\text{g}/\text{m}^3$)	MEASURED AS
CO	EA Environmental Standards	30,000	1-hour maximum
HCl	EA Environmental Standards	750	1-hour maximum
HF	EA Environmental Standards	16	Monthly mean
		160	1-hour maximum
Hg	EA Environmental Standards	0.25	Annual mean
		7.5	1-hour maximum
Sb	EA Environmental Standards	5	Annual mean
		150	1-hour maximum
As	EA Environmental Standards	0.003	Annual mean
Cr, as Cr (II) compounds and Cr (III) compounds	EA Environmental Standards	5	Annual mean
		150	1-hour maximum
Cr (VI), oxidation state in PM ₁₀ fraction	EA Environmental Standards	0.0002	Annual mean
Mn	EA Environmental Standards	0.15	Annual mean
		1,500	1-hour maximum
Ni	EA Environmental Standards	0.02	Annual mean
V	EA Environmental Standards	5	Annual mean
		1	1-hour maximum
NH ₃	EA Environmental Standards	180	Annual mean
		2,500	1-hour maximum
PCBs	EA Environmental Standards	0.2	Annual mean
		6	1-hour maximum

7.2.20 Defra has also published Local Air Quality Management (LAQM) Technical Guidance TG (16) (Defra, 2016) to assist local authorities in fulfilling their duties in relation to LAQM. Parts of this guidance, and associated tools, are also useful in assessing the impacts of individual developments within the planning process.

- 7.2.21 The Highways Agency (HA) (now Highways England) publication- the Design Manual for Roads and Bridges (DMRB) (HA, 2007), has been used to screen potential traffic air quality impacts to determine those impacts that may require more detailed assessment, and in the assessment of traffic air quality effects and the evaluation of significance.
- 7.2.22 The Institute of Air Quality Management (IAQM) has published several guidance documents relating to the potential effects of dust generation during construction works and development control (IAQM, 2014, 2016 and 2017).

7.3 Assessment Methodology and Significance Criteria

Overview

- 7.3.1 Full details of the methodology and approach taken in respect of this assessment are provided within Appendix 7A in PEI Report Volume III.
- 7.3.2 The technical assessment report within Appendix 7A in PEI Report Volume III provides a detailed description of the definition of sensitive human receptors, definition of sensitive ecological receptors, the methodology for the dispersion modelling of stack emissions and the methodology for screening operational and construction traffic changes.
- 7.3.3 A comparison of the effects between the Consented Development and the Proposed Development is provided in Section 7.6.

Consultation

- 7.3.4 The Environmental Health Department at North East Lincolnshire Council (NELC) was contacted between the 8th and 10th August 2018 and consulted on the approach to be taken to the air quality assessment for the Consented Development. At the request of NELC, the three month baseline NO₂ survey proposed by AECOM was extended to six months.
- 7.3.5 The EA was consulted (through face to face meetings and telephone calls with the Sustainable Places and Permitting teams) to agree the approach to preparing the Consented Development EIA. Consultation will continue as the DCO EIA progresses.

Impact Assessment and Significance Criteria

- 7.3.6 The potential emissions to air from construction and operation of the Proposed Development have been determined or estimated, and key local receptors have been identified, together with the current local ambient air quality. The potential concentrations resulting from the projected emissions arising from the operational Proposed Development have been predicted using atmospheric dispersion modelling techniques where appropriate. This has enabled the assessment of the impacts associated with the Proposed Development on the existing local ambient air quality and in particular on the identified sensitive receptors. The assessment methodology for each type of emission is detailed below.
- 7.3.7 The air quality assessment does not use the standard matrix for classification of effects as set out in Chapter 2: Assessment Methodology as specific guidance is used to determine air quality effects (as set out below), however to enable cross-reference between all technical chapters of the PEI Report the same terminology has been adopted whereby effects are described as negligible, minor, moderate or major and adverse or beneficial.
- 7.3.8 The process and traffic emissions assessments have been made with reference to the national air quality standards (NAQSS) and objectives laid out in the Air Quality Standards Regulations and environmental standards set out within EA guidance.

Development Scenarios

- 7.3.9 As outlined in Chapter 5: Construction Programme and Management there are three construction programme scenarios being considered for the purposes of the EIA. The assessment of air quality impacts during construction considers dust and emissions from activities and plant on Site, and construction traffic emissions.
- 7.3.10 The assessments of plant emissions and dust are not affected by the starting date of the construction period, so the assessment of these impacts is relevant to all three construction programme scenarios. However, the assessment of construction traffic emissions could be affected by a change to the starting date of the construction period because baseline traffic flows and background air quality change year on year. Air quality is predicted to improve each year, whereas base traffic flows are predicted to increase each year. The earliest construction scenario is considered to be the worst case for the construction traffic emissions assessment because of the higher vehicle emission factors and higher background concentrations. The assessment of construction traffic emissions therefore considers construction peak traffic in 2021 as a worst case.
- 7.3.11 As described in Section 7.5, the operational air quality assessment is based on a design with two stacks with fixed heights of 102 m AOD. Rochdale Envelope parameters for building dimensions have also been adopted as a worst case for the assessment. The building dimensions used in the air quality assessment are detailed in Appendix 7A.

Extent of Study Area

- 7.3.12 The Study Area for the stack emissions from the operational development extends up to 10 km from the Site, in order to assess the potential impacts on sensitive human health and ecological receptors, in line with the EA risk assessment methodology (Defra and EA, 2017). However, in practice the predicted impacts become negligible within a much smaller distance from the Site (circa 2 km).
- 7.3.13 The Study Area for construction dust and Non-Road Mobile Machinery (NRMM) emissions has been applied, in line with IAQM guidance (IAQM, 2014), extending:
- up to 350 m beyond the Site boundary and 50 m from the construction traffic route (up to 500 m from the Site entrances), for human health receptors; and
 - up to 50 m from the Site boundary and/or construction traffic route (up to 500 m from the Site entrances) for ecological receptors.

Assessment of Dust Emissions Generated During Construction Works

- 7.3.14 The movement and handling of soils and spoil during the Proposed Development construction activities is anticipated to lead to the generation of some short-term airborne dust. The occurrence and significance of dust generated by earth moving operations is difficult to estimate and depends heavily upon the meteorological and ground conditions at the time and location of the work within the Site, and the nature of the actual activity being carried out.
- 7.3.15 At present, there are no statutory UK or EU standards relating to the assessment or control of dust.
- 7.3.16 The emphasis of the regulation and control of construction dust is therefore through the adoption of good working practice on Site. It is intended that significant adverse environmental effects are avoided at the design stage and through embedded mitigation where possible, including the use of good working practices to minimise dust formation which is detailed further in Section 7.5 of this chapter.
- 7.3.17 The IAQM provides guidance for good practice qualitative assessment of risk of dust emissions from construction and demolition activities (IAQM, 2014). The guidance

considers the risk of dust emissions from unmitigated activities to cause human health (PM₁₀) impacts, dust soiling impacts, and ecological impacts (such as physical smothering, and chemical impacts for example from deposition of alkaline materials). The appraisal of risk is based on the scale and nature of activities and on the sensitivity of receptors, and the outcome of the appraisal is used to determine the level of good practice mitigation required for adequate control of dust.

7.3.18 The assessment undertaken for this chapter is consistent with the overarching approach to the assessment of the impacts of construction of the Proposed Development as outlined in Chapter 2: Assessment Methodology, and the application of example descriptors of impact and risk set out in IAQM guidance. It considers the significance of potential impacts with no mitigation, and recommends mitigation measures appropriate to the identified risks to receptors. The steps in the assessment are to:

- identify receptors within the screening distance of the Site boundary;
- identify the magnitude of impact through consideration of the scale, duration and location of construction activities being carried out;
- establish the sensitivity of the area through determination of the sensitivity of receptors and their distance from construction activities;
- determine the risk of significant impacts on receptors occurring as a result of the magnitude of impact and the sensitivity of the area, assuming no additional mitigation (beyond the identified development design and impact avoidance measures) is applied;
- determine the level of mitigation required based on the level of risk, to reduce potential impacts at receptors to insignificant or negligible; and
- summarise the potential residual effects of the mitigated works.

7.3.19 The criteria for assessment of magnitude, sensitivity and risk are summarised in Tables 7A.1-7A.5 in Appendix 7A in PEI Report Volume III.

Assessment of Construction and Operational Road Traffic

7.3.20 The incomplete combustion of fuel in vehicle engines results in the presence of hydrocarbons (HC) such as benzene and 1,3-butadiene, as well as the typical combustion products of CO, PM₁₀ and PM_{2.5} in exhaust emissions. Similarly, but to a lesser extent, any sulphur in the fuel can be converted to sulphur dioxide (SO₂) that is then released to atmosphere. In addition, at the high temperatures and pressures found within vehicle engines, some of the nitrogen in the air and the fuel is oxidised to form oxides of nitrogen, mainly in the form of nitric oxide (NO), which is then converted to nitrogen dioxide in the atmosphere. Nitrogen dioxide is associated with adverse effects on human health. Better emission control technology and fuel specifications are expected to reduce emissions per vehicle in the long term.

7.3.21 Although SO₂, CO, benzene and 1,3-butadiene are present in motor vehicle exhaust emissions, detailed consideration of the associated impacts on local air quality is not considered relevant in the context of this Proposed Development. This is because the release concentrations of these pollutants are low enough so as to not be likely to give rise to significant effects. In addition, no areas within the administrative boundaries of NELC are considered to be at risk of exceeding the relevant objectives for these pollutants, and the risks to achievement of the relevant air quality objectives in the vicinity of the Proposed Development are considered negligible. Emissions of SO₂, CO, benzene and 1, 3-butadiene from road traffic are therefore not considered further within this assessment.

- 7.3.22 Exhaust emissions from road vehicles may affect the ambient concentrations of the principal road traffic pollutants, nitrogen dioxide, PM₁₀ and PM_{2.5}, at sensitive receptors in the vicinity of the Proposed Development. Therefore, these pollutants are the focus of the assessment of the significance of road traffic air quality impacts.
- 7.3.23 DMRB HA207/07 guidance (HA, 2007) sets out criteria to establish the need for an air quality assessment. The guidance considers the changes in traffic anticipated as a result of a development, to identify the need for further evaluation or assessment; for example, in the DMRB guidance changes in Annual Average Daily Traffic (AADT) flows of more than 1,000 vehicles or 200 Heavy Duty Vehicles (HDV, all vehicles greater than 3.5t gross weight, including buses) movements are considered further through quantitative assessment; guidance published by the IAQM (IAQM, 2017) sets out a criteria of a change of 500 Light Duty Vehicles (LDV, all vehicles less than 3.5t gross weight) or 100 HDV (outside of an AQMA). For changes in traffic below these criteria, significant changes in air quality are not expected. The screening criterion in the DMRB also states that only properties and habitat sites within 200 m of roads should be considered in traffic assessments. This guidance has been utilised for both the construction and opening year assessments.
- 7.3.24 Predicted vehicle movements during the construction of the Proposed Development are shown in Table 7.6 and are detailed in Chapter 9: Traffic and Transport. The change in vehicle movements is predicted to peak at 312 one-way HDV movements accessing the Site via A180, A1173, Kiln Lane, Hobson Way and South Marsh Lane. There are several identified sensitive receptors within 200 m of affected links, and therefore a detailed assessment of construction traffic impacts has been conducted.
- 7.3.25 This assessment has used the latest version of dispersion model software 'ADMS-Roads' (v4.1.1.0) to quantify baseline pollution levels at selected receptors due to road traffic emissions. ADMS-Roads is a modern dispersion model that has an extensive published track record of use in the UK for the assessment of local air quality impacts, including model validation and verification studies (Cambridge Environmental Research Consultants (CERC), 2018).
- 7.3.26 The derivation of the traffic data used in this assessment is set out in Chapter 9: Traffic and Transport. The data used in the road traffic dispersion modelling has been provided for the following scenarios, with other proposed developments' traffic forecasts (referred to as 'committed development' traffic) included in the future scenarios as per the transport assessment:
- 2017 baseline traffic (for model verification process);
 - 2021 baseline traffic + committed development traffic (the total future baseline traffic flows for the Construction assessment);
 - 2021 baseline traffic + committed development traffic + peak construction traffic from the Proposed Development (the total traffic flows with the Proposed Development for the Construction assessment);
 - 2023 baseline traffic + committed development traffic (the total future baseline traffic flows for the Operation assessment); and
 - 2023 baseline traffic + committed development traffic + operational traffic from the Proposed Development (the total traffic flows with the Proposed Development for the Operation assessment).
- 7.3.27 The future decommissioning baseline scenario has not been assessed due to the lack of future traffic projections for when the Proposed Development is likely to be decommissioned (after 2052).

- 7.3.28 The traffic data used in the modelling of road traffic emissions are presented in Annex B of Appendix 7A in PEI Report Volume III.
- 7.3.29 Data in the form of traffic flows, composition (percentage heavy goods vehicles) and speed for the existing junction layout and the proposed layout have been used in modelling of emissions from road traffic during the construction phase of the Proposed Development.
- 7.3.30 Due to the uncertainty in the rate of vehicle emissions improvement over the coming years, this assessment has used emission rates (EFT Version 9.0.1 emission factor dataset) for 2017 (Defra, 2019b) to represent all assessment year scenarios. This is a conservative assumption.
- 7.3.31 Consideration has been given within the assessment to the potential cumulative traffic emissions from the construction of the Proposed Development as well as the contribution from traffic associated with other committed developments in the area. This is discussed further in Section 7.9 (Residual Effects) and Chapter 17: Cumulative and Combined Effects.

Assessment of Emissions Generated from Construction Site Plant (Non Road Mobile Machinery (NRMM))

- 7.3.32 As outlined in Chapter 5: Construction Programme and Management and above there are three scenarios being considered for the construction phase of the Proposed Development. In all scenarios the construction phase is anticipated to last around 36 months.
- 7.3.33 There are likely to be emissions to air during construction activities arising from on-Site construction plant or NRMM. The IAQM guidance (IAQM, 2014) states:
- “Experience of assessing the exhaust emissions from on-site plant ... 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”.*
- 7.3.34 The screening criterion in the DMRB (HA, 2007), which states that only properties and habitat sites within 200 metres of roads should be considered in traffic assessments, has also been considered in determining the potential for impacts from NRMM on sensitive receptors. A qualitative assessment of the potential for impact from nitrogen dioxide and PM₁₀ emissions from NRMM on identified receptors has therefore been made based on the criteria outlined in the above guidance.

Assessment of Process Emissions from the Operational Plant at Year of Opening

- 7.3.35 Emissions from the Proposed Development, assumed to be operational in 2023, have been assessed using the EA Risk assessment methodology (Defra and EA, 2018d) in order to identify where proposed emissions can be screened as having a negligible impact. Detailed dispersion modelling using the atmospheric dispersion model ADMS 5.2 has been used to calculate the concentrations of pollutants at identified receptors. These concentrations have been compared with the air quality assessment level for each pollutant species, as summarised in Tables 7.1, Table 7.2 and 7.3 above.
- 7.3.36 Dispersion modelling calculates the predicted concentrations arising from the emissions to atmosphere, based on Gaussian approximation techniques. The model employed has been developed for UK regulatory use.
- 7.3.37 The first year of operation (referred to as opening) of the Proposed Development is assumed to be 2023 for the purpose of this assessment, which is the earliest date that the Proposed Development could realistically start to export power commercially.

- 7.3.38 The assessment of worst-case long-term (annual mean) and short-term (daily and hourly mean) emissions resulting from operation of the Proposed Development has been undertaken by comparison of the maximum process contributions at identified sensitive receptors with the annual mean and hourly mean objectives, and the Critical Levels set out in Table 7.2 for ecological receptors, taking into consideration the baseline air quality, in accordance with EA risk assessment methodology (Defra and EA, 2017).
- 7.3.39 An assessment of nutrient nitrogen enrichment has been undertaken by applying published deposition velocities to the predicted annual average NO_x concentrations at the identified Statutory Habitat sites, determined through dispersion modelling, to calculate nitrogen deposition rates. These deposition rates have then been compared to the Critical Loads for nitrogen published by UK Air Pollution Information System (APIS) (Centre for Ecology and Hydrology and APIS, 2017) for the most sensitive species in each individual Habitat site, taking into consideration the baseline air quality.
- 7.3.40 Critical Loads and Critical Levels are tools for assessing air quality impacts on ecological receptors. The Critical Load relates to the quantity of pollutant deposited from air to the ground, whereas the Critical Level is the atmospheric concentration of a pollutant.
- 7.3.41 Potential increases in acidity on designated ecological receptors from depositional contributions of NO_x from the process contribution have also been considered. In this assessment, the nitrogen kilo equivalent Keq/ha/yr, which are the units in which acidity Critical Loads are measured, have been derived from nitrogen deposition modelling values using standard conversion factors. The acidity deposition rates and baseline deposition rates have been used within the Critical Load Function Tool (Centre for Ecology and Hydrology and APIS, 2017) to determine whether the contribution will result in exceedance of the defined acidity Critical Loads for the most sensitive feature. Process contributions of SO₂ to the acidity deposition rate have been included in the acid deposition calculations. Several non-statutory habitat sites have been assessed at the request of Natural England. These are Laporte Road Local Wildlife Site (LWS), Stallingborough Fish Ponds LWS, Healing Cress Beds LWS and Sweedale Croft Drain LWS. North Moss Lane Meadow and Field West of Power Station Sites of Nature Conservation Importance (SNCI) have not been included in dispersion modelling as their associated Critical Loads for nutrient and acid deposition are not on public records.

Evaluation of Significance – Construction Phase Emissions

- 7.3.42 For potential amenity effects, such as those related to dust deposition, the aim is to bring forward a scheme, to include mitigation measures as necessary, that minimises the potential for amenity (including dust soiling), human health, and ecological impacts as a result of the Proposed Development construction works.
- 7.3.43 The IAQM guidance (IAQM, 2014) does not provide a method for the evaluation of impacts on receptors from construction dust, rather a means to determine the level of mitigation required to avoid significant impacts on receptors. The guidance indicates that the application of appropriate mitigation should ensure that residual effects will normally be 'not significant'.

Evaluation of Significance – Operational Emissions

- 7.3.44 The evaluation of the significance of operational emissions on sensitive receptors considers the change in predicted pollutant concentrations against criteria set out in the 2010 Regulations and published guidance by Defra and the EA (Defra and EA, 2018d).
- 7.3.45 For a change of a given magnitude, the IAQM publication 'Land-Use Planning & Development Control: Planning for Air Quality (IAQM, 2017) has published recommendations for describing the magnitude of long term impacts at individual receptors and describing the significance (Table 7.4) of effects. This terminology has

been changed where appropriate in order to maintain consistency with the rest of this ES – where the IAQM uses ‘substantial’ this has been changed to ‘major’, and ‘slight’ has been changed to ‘minor’.

Table 7.4: Air quality effect descriptor for long term changes in ambient pollutant concentrations

LONG TERM AVERAGING CONCENTRATION AT RECEPTOR	PERCENTAGE CHANGE IN ANNUAL MEAN CONCENTRATIONS				
	Up to 0.5% Imperceptible	0.5 – 1% Very low	2-5% Low	6-10% Medium	>10% High
75% or less of AQAL	Negligible	Negligible	Negligible	Minor	Moderate
76-94% of AQAL	Negligible	Negligible	Minor	Moderate	Moderate
95-102% of AQAL	Negligible	Minor	Moderate	Moderate	Major
103-109% of AQAL	Negligible	Moderate	Moderate	Major	Major
110% or more of AQAL	Negligible	Moderate	Major	Major	Major

AQAL = Air Quality Assessment Level (NAQS objective or EU Limit Value or Environmental Standard)

- 7.3.46 The IAQM guidance (IAQM, 2017) is not explicit in the identification of whether any of the above effect descriptors should be considered ‘significant’ or ‘not significant’, rather it indicates that the descriptors should be applied to individual receptors and a ‘moderate’ adverse effect at one receptor may not mean that the overall effect is significant; other factors need to be considered. However, it indicates further that ‘negligible’ effects are likely to lead to effects that are ‘not significant’ and ‘major’ effects describe the potential for ‘significant’ effects. The judgment of significance of effects adopted within this assessment is discussed below.
- 7.3.47 The evaluation of the significance of air quality effects from the operational point sources (stack emissions) has been based on the criteria referenced in the IAQM publication (IAQM, 2017), and on the criteria outlined in the EA EPR Risk Assessment (Defra and EA, 2018d).
- 7.3.48 The IAQM guidance (IAQM, 2017) indicates that the EA threshold criterion of 10% of the short term AQAL is sufficiently small in magnitude to be regarded as having an ‘insignificant’ effect. The IAQM guidance deviates from the EA guidance (discussed below) with respect to the background contribution; the IAQM guidance indicates that severity of peak short-term concentrations can be described without the need to reference background concentrations as the process contribution (PC) is used to measure impact, not the overall concentration at a receptor. The peak short term PC from an elevated source is described as follows:
- PC ≤10% of the NAQS represents an ‘insignificant’ (negligible) impact;
 - PC 11-20% of the NAQS is small in magnitude representing a ‘slight’ (minor) impact;
 - PC 21-50% of the NAQS is medium in magnitude representing a moderate impact; and
 - PC >51% of the NAQS is large in magnitude representing a ‘substantial’ (major) impact.

7.3.49 The EA EPR Risk Assessment (Defra and EA, 2018d) screening criteria for comparison of PCs with NAQS objectives state that an emission may be considered insignificant (or negligible) where:

- Short term PC $\leq 10\%$ of the NAQS; and
- Long term PC $\leq 1\%$ of the NAQS.

7.3.50 The second stage of screening considers the PCs in the context of the existing background pollutant concentrations; the predicted environmental concentration (PEC) is considered acceptable where:

- short term PC $< 20\%$ of the short-term NAQS minus twice the long-term background concentration; and
- long term Predicted Environmental Concentration (PEC) (PC + background concentration) $< 70\%$ of the NAQS.

7.3.51 Where the PEC is not predicted to exceed the NAQS objective and the proposed emissions comply with the BAT associated emission levels (or equivalent requirements) the emissions are considered acceptable by the EA.

7.3.52 The effect of point source emissions on ecological receptors, through deposition of nutrient nitrogen or acidity, has been evaluated using the EA insignificance criterion of 1% of the long term objective, as above.

7.3.53 Where emissions are not screened as insignificant (negligible), the descriptive terms for the air quality effect outlined in Table 7.4 above have been applied.

Evaluation of Significance – Proposed Development as a Whole

7.3.54 Following the assessment of each individual air quality effect, the significance of all of the reported effects is then considered for the Proposed Development in overall terms. The potential for the Proposed Development to contribute to or interfere with the successful implementation of policies and strategies for the management of local air quality are considered if relevant, but the principal focus is any change to the likelihood of future achievement of the air quality standards (which also relate to compliance with local authority goals for local air quality management and objectives are set for the protection of human health).

7.3.55 In terms of the significance of the effects (consequences) of any impacts, an effect is reported as being either 'not significant' or as being 'significant'. If the overall effect of the development on local air quality or on amenity is found to be 'moderate' or 'major' this is deemed to be 'significant' for EIA purposes. Effects found to be 'minor' or 'negligible' are considered to be 'not significant'.

Sources of Information / Data

Operational Phase Data

7.3.56 The physical parameters for the modelling of emissions from the Proposed Development stacks have been sourced from the concept design data provided by Fichtner Consulting Engineers (FCE), and the pollutant mass emission rates have been calculated by AECOM, based on the relevant IED emission limits or BAT-AELs. They are summarised in Table 7A.12 and Table 7A.13 of Appendix 7A in PEI Report Volume III.

7.3.57 The dispersion modelling of point source emissions has taken into consideration the sensitivity of predicted results to model input variables, and to ultimately identify the realistic worst-case results for inclusion in the assessment. These variables include:

- meteorological data, for which five years' recent data from a representative meteorological station (Humberside Airport) have been used; and
- inclusion of buildings, structures and local topography that could affect dispersion from the source into the modelling scenarios.

7.4 Baseline Conditions

Existing Baseline

Sensitive Receptors

- 7.4.1 During the construction phase of the Proposed Development, based on IAQM guidance (IAQM, 2014), receptors potentially affected by dust soiling and short term concentrations of PM₁₀ generated during construction activities are limited to those located within 350 m of the nearest construction activity, and/or within 50 m of a public road used by construction traffic that is within 500 m of the construction site entrances. Ecological receptors are limited to those located within 50 m of the nearest construction activity and/or within 50 m of a public road used by construction traffic that is within 500 m of the construction site entrances.
- 7.4.2 Receptors potentially affected by the exhaust emissions associated with construction phase vehicle movements are those located within 200 m of a public road used by construction traffic to access the Site. In this instance, it is assumed for the purposes of assessment (in accordance with Chapter 9: Traffic and Transport) that construction vehicles will use South Marsh Lane, Hobson Way, Kiln Lane, A1173 and the A180 towards the M180.
- 7.4.3 Receptors potentially affected by operational emissions from the Proposed Development including local residential and amenity receptors have been identified through site knowledge, desk study of local mapping and consultation. Isopleth figures of pollutant dispersion have been examined to identify the receptors that will receive the highest point source contributions and the assessment of impact has been made at these receptors; the assessment also includes designated AQMAs within the Study Area, described below.
- 7.4.4 Ecological receptors potentially affected by operational emissions have been identified through desk study of Defra Magic mapping (Defra, 2017c) and consultation (see Chapter 7: Ecology and Nature Conservation). Statutory designated sites including Sites of Special Scientific Interest (SSSIs) up to 2 km and SACs up to 10 km from the Site have been considered, with those further from the Site identified through consultation with NELC and the EA. The Humber Estuary Ramsar site, SSSI, SPA and SAC is within 2 km of the Site. Several non-statutory designated sites including SNCIs and LWSs have been identified through consultation and included in the assessment where required. Further details of these sites and reasons for designations are provided in Chapter 10: Ecology and Nature Conservation.
- 7.4.5 Identified receptors are detailed in Table 7.5 below, for construction and operational phases, and are shown on Figure 7.1 and 7.2 in PEI Report Volume II. The distances quoted from construction phase activities include the proximity of any part of the designated routes used by construction vehicles for the Proposed Development.

Table 7.5: Identified receptors with potential for air quality impacts from construction and operation of the Proposed Development

ID	RECEPTOR NAME	RECEPTOR TYPE	GRID REFERENCE		DISTANCE FROM BOUNDARY FOR IMPACTS FROM:		FIGURE REFERENCE
			X	Y	Operation (m)	Dust (m)	
R1	Mauxhall Farm	Residential	519164	413247	3,780	420	Figure 7.1
R2	Property on North Moss Lane	Residential	521290	413089	1,300	850	Figure 7.1
R3	Property on South Marsh Road	Residential	521591	413001	1,680	1,150	Figure 7.1
R4	Property on South Marsh Road	Residential	521298	412771	1,760	1,230	Figure 7.1
R5	Property on South Marsh Road	Residential	521258	412700	1,800	1,290	Figure 7.1
R6	Property on South Marsh Road	Residential	521171	412590	1,900	1,380	Figure 7.1
R7	Primrose Cottage, north of A180	Residential	521900	412105	1,640	2,130	Figure 7.1
R8	Cress Cottage, north of A180	Residential	521988	411994	1,680	2,330	Figure 7.1
R9	The Meadows, south of A180	Residential	522051	411669	1,920	1,530	Figure 7.1
R10	Meadows Farm, south of A180	Residential	521900	411653	2,170	1,600	Figure 7.1
R11	Meadows Cottages, south of A180	Residential	521900	411605	2,170	1,600	Figure 7.1
R12	Property on South Marsh Road in Stallingborough	Residential	520822	412113	2,500	2,150	Figure 7.1
R13	Property on Woad Lane in Grimsby	Residential	524372	410818	2,900	2,570	Figure 7.1
R14	Property on Kendal Road, Immingham	Residential	519215	414218	3,820	1,100	Figure 7.1

ID	RECEPTOR NAME	RECEPTOR TYPE	GRID REFERENCE		DISTANCE FROM BOUNDARY FOR IMPACTS FROM:		FIGURE REFERENCE
			X	Y	Operation (m)	Dust (m)	
R15	Property on Hadleigh Road, Immingham	Residential	518810	414142	4,180	1,280	Figure 7.1
R16	Property on Arran Close, Immingham	Residential	518580	413796	4,400	1,190	Figure 7.1
R17	Property on Mull Way, Immingham	Residential	518388	413642	4,570	500	Figure 7.1
R18	Willows Court, Immingham	Residential	517721	413749	5,220	270	Figure 7.1
R19	Property north of Habrough	Residential	515237	414003	7,700	100	Figure 7.1
R20	Property on Station Road in Habrough	Residential	515087	414241	7,900	70	Figure 7.1
R21	Grimsby AQMA	Residential	527731	410459	5,470	5,290	Figure 7.1
PROW 1	Public Right of Way (various points along the same route).	Transient	522277	413722	720	60	Figure 7.1
PROW 2		Transient	522434	413788	620	240	Figure 7.1
PROW 3		Transient	522603	413840	510	380	Figure 7.1
PROW 4		Transient	522762	413932	500	440	Figure 7.1
PROW 5		Transient	522985	413983	490	460	Figure 7.1
PROW 6		Transient	523270	413886	405	360	Figure 7.1
PROW 7		Transient	523401	413749	345	300	Figure 7.1
PROW 8		Transient	523538	413599	390	390	Figure 7.1
PROW 9		Transient	523644	413397	470	470	Figure 7.1
PROW 10		Transient	523787	413140	620	620	Figure 7.1
PROW 11		Transient	523985	413119	880	880	Figure 7.1
PROW 12		Transient	524146	412958	1,050	1,050	Figure 7.1
E1_1	Atlantic Salt Meadows	Humber Estuary SSSI,	523841	413152	680	680	Figure 7.2

ID	RECEPTOR NAME	RECEPTOR TYPE	GRID REFERENCE		DISTANCE FROM BOUNDARY FOR IMPACTS FROM:		FIGURE REFERENCE
			X	Y	Operation (m)	Dust (m)	
E1_2	Atlantic Salt Meadows	Ramsar site, SPA and SAC	523795	413177	680	680	Figure 7.2
E1_3	Atlantic Salt Meadows		523891	413167	680	680	Figure 7.2
E2_1	Atlantic Salt Meadows		525875	411461	3,300	3,300	Figure 7.2
E2_2	Atlantic Salt Meadows		526051	411348	3,500	3,500	Figure 7.2
E2_3	Atlantic Salt Meadows		526204	411085	3,780	3,780	Figure 7.2
E2_4	Atlantic Salt Meadows		526384	411077	3,940	3,940	Figure 7.2
E3_1	Atlantic Salt Meadows		527221	410770	4790	4,790	Figure 7.2
E4_1	Acid Fixed Dunes		531237	408287	9,550	9,550	Figure 7.2
E4_2	Acid Fixed Dunes		531313	408200	9,620	9,620	Figure 7.2
E4_3	Acid Fixed Dunes		531397	408097	9,770	9,770	Figure 7.2
E4_4	Acid Fixed Dunes		531499	408035	9,900	9,900	Figure 7.2
E4_5	Acid Fixed Dunes		531547	407962	10,000	10,000	Figure 7.2
E4_6	Acid Fixed Dunes		531540	407912	10,000	10,000	Figure 7.2
E5_1	Atlantic Salt Meadows		531682	408046	10,050	10,050	Figure 7.2
E5_2	Atlantic Salt Meadows		531750	407998	10,130	10,130	Figure 7.2
E5_3	Atlantic Salt Meadows		531793	407923	10,200	10,200	Figure 7.2
E5_4	Atlantic Salt Meadows		531863	407852	10,300	10,300	Figure 7.2
E5_5	Atlantic Salt Meadows		531926	407779	10,400	10,400	Figure 7.2
E5_6	Atlantic Salt Meadows		532034	407667	10,500	10,500	Figure 7.2

ID	RECEPTOR NAME	RECEPTOR TYPE	GRID REFERENCE		DISTANCE FROM BOUNDARY FOR IMPACTS FROM:		FIGURE REFERENCE
			X	Y	Operation (m)	Dust (m)	
E5_7	Atlantic Salt Meadows		532175	407545	10,600	10,600	Figure 7.2
E5_8	Atlantic Salt Meadows		532324	407415	10,700	10,700	Figure 7.2
E5_9	Atlantic Salt Meadows		532520	407260	10,800	10,800	Figure 7.2
E5_10	Atlantic Salt Meadows		532616	407081	11,000	11,000	Figure 7.2
E6_1	neutral grassland	Laporte Road LWS	521571	414727	1,870	1,870	Figure 7.2
E6_2	neutral grassland		521576	414769	1,920	1,920	Figure 7.2
E7_1	Broadleaved, mixed and yew woodland	Stallingborough Fish Ponds LWS	521306	412565	1,850	1,850	Figure 7.2
E7_2	Broadleaved, mixed and yew woodland		521391	412451	1,840	1,840	Figure 7.2
E8_1	Broadleaved, mixed and yew woodland	Healing Cress Beds LWS	522076	412246	1,430	1,430	Figure 7.2
E8_2	Broadleaved, mixed and yew woodland		522170	412159	1,500	1,500	Figure 7.2
E9_1	Fen, Marsh and Swamp	Sweedale Croft Drain LWS	523451	411593	1,850	1,850	Figure 7.2
E9_2	Fen, Marsh and Swamp		523599	411714	1,740	1,740	Figure 7.2
E9_3	Fen, Marsh and Swamp		523710	411805	1,680	1,680	Figure 7.2

Existing Air Quality

- 7.4.6 Existing air quality conditions in the vicinity of the Site have been evaluated through a review of local authority air quality management reports; Defra published data and other sources. The key pollutants of concern resulting from construction and operation of the Proposed Development and that have potentially elevated background concentrations from other sources are oxides of nitrogen, carbon monoxide, ammonia, PM₁₀ and PM_{2.5}, therefore the assessment of baseline conditions within this chapter considers these pollutants only. Baseline concentrations of the other pollutants such as hydrogen chloride (HCl), hydrogen fluoride (HF), twelve metals (cadmium (Cd), thallium (Tl), mercury (Hg), antimony (Sb), arsenic (As), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Ni) and vanadium (V)), Polycyclic Aromatic Hydrocarbons (PAH) as benzo[a]pyrene, polychlorinated dibenzo-para-dioxins and polychlorinated dibenzo furans (referred to as dioxins and furans), and volatile organic compounds (VOCs) such as benzene are also included in the dispersion modelling assessment and are set out in Appendix 7A in PEI Report Volume III.
- 7.4.7 NELC has designated one AQMA in Grimsby. The Grimsby AQMA was declared for an exceedance of the annual mean NO₂ objective. This AQMA is located approximately 5.5 km south-east of the Site. The Grimsby AQMA is shown in Figure 7.1.
- 7.4.8 NELC undertake monitoring within Immingham and Grimsby (NELC, 2019) at 32 locations for NO₂, by diffusion tube monitoring, and with one continuous monitoring station for NO₂, operated as part of the Defra AURN. The nearest NO₂ continuous monitor CM2 is located on Woodlands Avenue in Immingham 3.7 km north-east of the Site. Annual mean NO₂ concentrations for 2018 were reported as 13.9 µg/m³. The diffusion tubes located in Immingham are DIF23, DIF24 and DIF25 which have an average annual mean concentration for 2018 of 26.6 µg/m³.
- 7.4.9 NELC monitoring data has been used to provide information on background concentrations within the Grimsby AQMA (DIF14, DIF15 and DIF16).
- 7.4.10 A summary of the NELC monitoring data are presented in Table 7.6. The available NELC monitoring data is not located in the vicinity of the Site, nor along any roads that are likely to be used during the construction and operational phases of the Proposed Development. These monitoring locations are not considered to be suitable for model verification. Therefore, AECOM has undertaken project specific diffusion tube monitoring.
- 7.4.11 A programme of NO₂ diffusion tube surveys was carried out between June and December 2018. A summary of the project specific monitoring locations and monitoring results is presented in Table 7.7.

Table 7.6: NELC NO₂ diffusion tube monitoring

ID	MONITORING LOCATION	SITE TYPE	GRID REFERENCE		2018 ANNUAL MEAN CONC. (µg/m ³)
			X	Y	NO ₂
DIF 14	113 Cleethorpe Road, Grimsby	Kerbside	527761	410446	33.3
DIF 15	123 Cleethorpe Road, Grimsby	Kerbside	527802	410436	32.9
DIF 16	6 Freeman Street, Grimsby	Kerbside	527693	410423	30.9
DIF 23	Kings Road, Immingham	Roadside	519193	415279	26.6
DIF 24					
DIF 25					

Table 7.7: Project specific NO₂ diffusion tube monitoring

ID	MONITORING LOCATION	SITE TYPE	GRID REFERENCE		SURVEY PERIOD MEAN CONC. (µg/m ³)	2017 ANNUAL-ISED MEAN CONC. (µg/m ³)
			X	Y	NO ₂	NO ₂
KOA T1	Near salt marsh section of Humber Estuary SSSI, Ramsar site, SPA, SAC	Other	523788	413171	13.4	12.5
KOA T2	Woad Lane, Grimsby	Roadside	524382	410798	18.4	17.1
KOA T3	Ephams Lane north of Stallingborough	Roadside	521150	412579	17.6	16.4
KOA T4	Station Road, Stallingborough	Roadside	520824	412134	15.0	13.9
KOA T5	Roxton Road, Immingham	Roadside	517726	413761	21.6	20.9
KOA T6	Near Wold Chapel Hotel, Habrough	Roadside	515250	413996	18.8	17.5

7.4.12 Background data has also been obtained from Defra published maps for the locations of likely maximum impact due to point source emissions from the Proposed Development, and at the selected sensitive receptor locations (R1 to R20). The most recent data available from the background maps is for a base year of 2017, which has been conservatively assumed to be representative of the peak construction year (2021) and opening year baselines (2023).

- 7.4.13 The background NO₂ concentration for receptors R1 to R20 was sourced from project specific monitoring at location KOA T1. The background NO₂ concentration for R21 was sourced from NELC monitoring location DIF 14, which is a kerbside location within the Grimsby AQMA.
- 7.4.14 Background NO₂, CO, PM₁₀ and PM_{2.5} concentrations assumed for the selected sensitive receptors are provided in Table 7.8 below. It indicates NO₂ concentrations within the vicinity of the Proposed Development are consistently well below the NAQS annual mean objective. Background data for NO₂ and PM₁₀ at sensitive receptors for point source and traffic emission impacts is provided in Table 7.8.
- 7.4.15 The background air pollutant concentrations in the vicinity of the Proposed Development are consistently well below the NAQS objective value for nitrogen dioxide at all reported monitoring locations. Data reported by NELC (NELC, 2017) also indicate that air quality is generally very good in the borough, with only monitoring locations within the centre of Grimsby and Immingham reporting elevated concentrations of nitrogen dioxide.

Table 7.8: Background concentrations at receptors

POLLUTANT	ANNUAL MEAN CONCENTRATION (µg/m ³)
	2015
Nitrogen dioxide (NO ₂)	12.5 for R1 to R20 33.3 for R21
PM ₁₀	14.1
PM _{2.5}	8.2
Carbon monoxide (CO)	258

- 7.4.16 Baseline annual mean concentrations of NO₂, PM₁₀ and PM_{2.5}, and the number of expected exceedances of the 24-hour 50 µg/m³ PM₁₀ air quality objectives at the selected receptors during the current 2017 baseline scenario are listed in Table 7.9 below.

Table 7.9: Air quality statistics predicted for baseline scenario in 2017

ID	RECEPTOR NAME	ANNUAL MEAN POLLUTANT CONCENTRATION (µg/m ³)			NUMBER OF DAYS OF EXCEEDANCE OF 24-HOUR MEAN OF 50 µg/m ³ (DAYS)
		NO ₂	PM ₁₀	PM _{2.5}	
R1	Mauxhall Farm	17.1	14.9	8.7	1
R2	Property on North Moss Lane	15.4	14.6	8.5	1
R3	Property on South Marsh Road	15.6	14.6	8.5	1
R4	Property on South Marsh Road	16.9	14.9	8.7	1
R5	Property on South Marsh Road	17.4	15.0	8.7	1
R6	Property on South Marsh Road	19.1	15.3	8.9	1
R7	Primrose Cottage, north of A180	21.2	15.7	9.2	1

ID	RECEPTOR NAME	ANNUAL MEAN POLLUTANT CONCENTRATION ($\mu\text{g}/\text{m}^3$)			NUMBER OF DAYS OF EXCEEDANCE OF 24-HOUR MEAN OF $50 \mu\text{g}/\text{m}^3$ (DAYS)
		NO ₂	PM ₁₀	PM _{2.5}	
R8	Cress Cottage, north of A180	23.5	16.1	9.4	1
R9	The Meadows, south of A180	17.6	15.0	8.8	1
R10	Meadows Farm, south of A180	15.9	14.7	8.6	1
R11	Meadows Cottages, south of A180	15.5	14.6	8.5	1
R12	Property on South Marsh Road in Stallingborough	15.9	14.7	8.6	1
R13	Property on Wood Lane in Grimsby	17.1	14.9	8.7	1
R14	Property on Kendal Road, Immingham	14.2	14.4	8.4	1
R15	Property on Hadleigh Road, Immingham	14.4	14.4	8.4	1
R16	Property on Arran Close, Immingham	15.1	14.6	8.5	1
R17	Property on Mull Way, Immingham	15.8	14.7	8.6	1
R18	Willows Court, Immingham	17.3	15.0	8.7	1
R19	Property north of Habrough	16.3	14.8	8.6	1
R20	Property on Station Road in Habrough	24.4	16.3	9.5	1
R21	Grimsby AQMA	33.5	14.1	8.2	1

7.4.17 The baseline values show that concentrations of all pollutants in the vicinity of the Site are well below the NAQS values, indicating that air quality in the vicinity of the Proposed Development is good. More elevated concentrations of NO₂ are found within the Grimsby AQMA; however they are still within their respective environmental standards.

7.4.18 The existing air quality concentrations and acid and nutrient nitrogen deposition rates at the designated habitat sites have been obtained from the APIS website. This data is presented in full in Appendix 7A in PEI Report Volume III. The data indicates that existing baseline NO_x concentrations at the ecological receptors are generally well within the daily mean and annual mean Critical Levels. The exception is the salt marsh location closest to the Site (E1) (refer to Figure 7.2 in PEI Report Volume II), where the APIS NO_x background value is very close to exceeding the Critical Level. The existing baseline nutrient nitrogen deposition and acid deposition levels for many of the identified designated ecological sites exceed the lower range Critical Loads defined for the most

sensitive species present in Appendix 7A (PEI Report Volume III), including the acid fixed dune habitat at Cleethorpes, 9.5 km to the south-east of the Site.

Future Construction Baseline

7.4.19 Predicted annual mean concentrations of NO₂, PM₁₀ and PM_{2.5}, and the number of exceedances of the 24-hour 50 µg/m³ PM₁₀ air quality objective, at the selected receptors during the future 2021 baseline scenario for the Consented Development are listed in Table 7.10. As described at paragraph 7.3.26 the future baseline traffic flows used for the assessment include other committed developments.

Table 7.10: Air quality baseline statistics predicted for 2021 baseline scenario (including other committed developments)

ID	RECEPTOR NAME	ANNUAL MEAN POLLUTANT CONCENTRATION (µg/m ³)			NUMBER OF DAYS OF EXCEEDANCE OF 24-HOUR MEAN OF 50 µg/m ³ (DAYS)
		NO ₂	PM ₁₀	PM _{2.5}	
R1	Mauxhall Farm	17.7	15.0	8.7	1
R2	Property on North Moss Lane	15.7	14.7	8.5	1
R3	Property on South Marsh Road	15.9	14.7	8.6	1
R4	Property on South Marsh Road	17.3	14.9	8.7	1
R5	Property on South Marsh Road	17.8	15.0	8.8	1
R6	Property on South Marsh Road	19.6	15.4	9.0	1
R7	Primrose Cottage, north of A180	21.9	15.8	9.2	1
R8	Cress Cottage, north of A180	24.4	16.3	9.5	1
R9	The Meadows, south of A180	18.1	15.1	8.8	1
R10	Meadows Farm, south of A180	16.2	14.8	8.6	1
R11	Meadows Cottages, south of A180	15.8	14.7	8.5	1
R12	Property on South Marsh Road in Stallingborough	16.2	14.7	8.6	1
R13	Property on Woad Lane in Grimsby	17.5	15.0	8.7	1
R14	Property on Kendal Road, Immingham	14.4	14.4	8.4	1
R15	Property on Hadleigh Road, Immingham	14.6	14.5	8.4	1
R16	Property on Arran Close, Immingham	15.4	14.6	8.5	1

ID	RECEPTOR NAME	ANNUAL MEAN POLLUTANT CONCENTRATION ($\mu\text{g}/\text{m}^3$)			NUMBER OF DAYS OF EXCEEDANCE OF 24-HOUR MEAN OF $50 \mu\text{g}/\text{m}^3$ (DAYS)
		NO ₂	PM ₁₀	PM _{2.5}	
R17	Property on Mull Way, Immingham	16.2	14.8	8.6	1
R18	Willows Court, Immingham	17.9	15.1	8.8	1
R19	Property north of Habrough	16.7	14.9	8.7	1
R20	Property on Station Road in Habrough	25.7	16.6	9.7	1
R21	Grimsby AQMA	33.5	14.1	8.2	1

7.4.20 The predicted baseline construction year pollutant concentrations are well below all NAQS values for all pollutants, indicating that air quality in the vicinity of the Proposed Development is good. As for 2017, higher concentrations of NO₂ are predicted within the Grimsby AQMA, though still within the NAQS objective values.

Future Operational Baseline

7.4.21 Predicted annual mean concentrations of NO₂, PM₁₀ and PM_{2.5}, and the number of predicted exceedances of the 24-hour $50 \mu\text{g}/\text{m}^3$ PM₁₀ air quality objective, at the selected receptors during the 2023 future baseline scenario are listed in Table 7.11.

Table 7.11: Air quality statistics predicted for 2023 baseline scenario (including other committed developments)

ID	RECEPTOR NAME	ANNUAL MEAN POLLUTANT CONCENTRATION ($\mu\text{g}/\text{m}^3$)			NUMBER OF DAYS OF EXCEEDANCE OF 24-HOUR MEAN OF $50 \mu\text{g}/\text{m}^3$ (DAYS)
		NO ₂	PM ₁₀	PM _{2.5}	
R1	Mauxhall Farm	18.0	15.0	8.8	1
R2	Property on North Moss Lane	15.9	14.7	8.6	1
R3	Property on South Marsh Road	16.0	14.7	8.6	1
R4	Property on South Marsh Road	17.5	15.0	8.7	1
R5	Property on South Marsh Road	18.0	15.1	8.8	1
R6	Property on South Marsh Road	19.8	15.4	9.0	1
R7	Primrose Cottage, north of A180	22.2	15.9	9.3	1
R8	Cress Cottage, north of A180	24.7	16.4	9.6	1
R9	The Meadows, south of A180	18.2	15.1	8.8	1

ID	RECEPTOR NAME	ANNUAL MEAN POLLUTANT CONCENTRATION ($\mu\text{g}/\text{m}^3$)			NUMBER OF DAYS OF EXCEEDANCE OF 24-HOUR MEAN OF $50 \mu\text{g}/\text{m}^3$ (DAYS)
		NO ₂	PM ₁₀	PM _{2.5}	
R10	Meadows Farm, south of A180	16.3	14.8	8.6	1
R11	Meadows Cottages, south of A180	15.9	14.7	8.6	1
R12	Property on South Marsh Road in Stallingborough	16.3	14.8	8.6	1
R13	Property on Woad Lane in Grimsby	17.6	15.0	8.8	1
R14	Property on Kendal Road, Immingham	14.6	14.5	8.4	1
R15	Property on Hadleigh Road, Immingham	14.7	14.5	8.4	1
R16	Property on Arran Close, Immingham	15.6	14.6	8.5	1
R17	Property on Mull Way, Immingham	16.4	14.8	8.6	1
R18	Willows Court, Immingham	18.2	15.1	8.8	1
R19	Property north of Habrough	16.9	14.9	8.7	1
R20	Property on Station Road in Habrough	26.4	16.7	9.8	1
R21	Grimsby AQMA	33.5	14.1	8.2	1

7.4.22 Predicted baseline pollutant concentrations in the 2023 baseline scenario (including other committed developments) show that concentrations of all pollutants are below NAQS values, indicating that air in the vicinity of the Proposed Development is of good quality.

Point Source Emissions Background Concentrations for different averaging times

7.4.23 In accordance with EA risk assessment methodology (Defra and EA, 2017), the annual mean background pollutant concentrations have been obtained from Defra background mapping (2017 base year) as described above and the short-term background concentration is assumed to be twice the long-term concentration for NO₂ and CO and one and a half times the long-term background concentration for PM₁₀.

7.5 Development Design and Impact Avoidance

Construction

Construction Environmental Management Plan

7.5.1 Emissions of dust and particulates from the construction phase of the Proposed Development will be controlled in accordance with good working practices regularly

employed in the construction industry, through incorporation of appropriate control measures according to the risks posed by the activities undertaken, as determined through this assessment process. The management of dust and particulates and application of adequate mitigation measures will be enforced through embedding measures in the Construction Environmental Management Plan (CEMP). A Framework CEMP has been prepared and is included as Appendix 5A in PEI Report Volume III.

7.5.2 Based on an initial assessment of the area of sensitivity to dust impacts and the likely risk of impacts arising from each of the key construction activities (earthworks, construction and trackout of material onto roads) (refer to Appendix 7A), and as described in Section 7.6 below, appropriate embedded measures to be implemented during construction (good site techniques drawn from the 'high risk' site schedule in IAQM guidance) that have been identified are:

- where appropriate, storage of sand and aggregates in bunded areas and storage of cement powder and fine materials in silos;
- use of water suppression and regular cleaning to minimise mud on roads;
- covering of vehicles leaving the construction site that are carrying construction waste materials or spoil;
- employment of a wheel wash system at site exits;
- restriction where practicable of the use of unmade road access;
- minimising storage duration of top soil or spoil during construction; and
- prohibiting open fires on Site.

7.5.3 Good practice measures will also be employed for the siting and operation of NRMM to control associated emissions, including where possible:

- minimising vehicle and plant idling; and
- locating static plant away from sensitive boundaries or receptors, in particular by retaining the existing landscaping around the Site.

Operation

IED/ BAT-AEL Emission Limit Value (ELV) Compliance

7.5.4 The Proposed Development will be designed such that process emissions to air comply with the ELV requirements specified in the IED. This will be regulated by the EA through the Environmental Permit required for the operation of the Proposed Development.

Stack Height

7.5.5 The stack heights for the Proposed Development have been set at 102 m above Ordnance Datum (approximately 100m above finished ground level), in order to provide appropriate dispersion of the emitted pollutants. An analysis of the effect of increasing stack height on ground level impacts has been included in Appendix 7A in PEI Report Volume III.

7.6 Likely Impacts and Effects

Pollutants

Impacts on Human Health and Sensitive Ecosystems

7.6.1 The pollutants considered within the assessment of emissions for the main stacks are primarily those prescribed within the IED (European Commission, 2010). These are:

- oxides of nitrogen (NO_x), expressed as NO₂;

- particulate matter (as PM₁₀ size fraction);
- carbon monoxide (CO);
- sulphur dioxide (SO₂);
- hydrogen chloride (HCl);
- hydrogen fluoride (HF);
- twelve metals (cadmium (Cd), thallium (Tl), mercury (Hg), antimony (Sb), arsenic (As), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Ni) and vanadium (V));
- polychlorinated dibenzo-para-dioxins and polychlorinated dibenzo furans (referred to as dioxins and furans); and
- volatile organic compounds (VOCs), as a measure of total organic compounds.

7.6.2 Emissions of the following pollutants not included within the IED are also considered:

- the Polycyclic Aromatic Hydrocarbons (PAH), benzo[a]pyrene;
- ammonia (chemical formula NH₃); and
- particulate matter (as PM_{2.5} size fraction).

7.6.3 PAHs are produced as a result of incomplete combustion. One of the key PAH species, benzo[a]pyrene, is subject to a national air quality objective in the UK. Ammonia is recognised as having the potential to impact on sensitive ecological habitats, both directly and as a component of acid and nutrient nitrogen deposition. The finer size fraction of particulate matter (PM_{2.5}) has increasingly become associated with impacts on health in recent years and has subsequently been included within the statutory limit values set out within the most recent European and UK air quality legislation.

7.6.4 Of the pollutants listed above, the primary pollutants of interest in relation to the impacts due to emissions from the Proposed Development and road traffic are nitrogen dioxide and particulate matter (PM₁₀ and PM_{2.5} size fractions). The primary pollutant of concern for ecological impacts is ammonia.

Impacts on Amenity

7.6.5 'Dust' is defined in British Standard (BS) 6069-2:1994 (British Standards Institute (BSI), 1994) as particulate matter in the size range 1 µm – 75 µm (microns) in diameter, and is primarily composed of mineral materials and soil particles. This definition is also referred to in NPPF technical guidance (Ministry of Housing, Government & Local Government, 2018b) in the context of dust impacts from mineral extraction operations. The BSI definition has been adopted in this assessment.

7.6.6 Odour could be generated through the receipt and handling of waste materials at the Proposed Development. The presence of an odour may or may not cause annoyance and depends on a number of factors that vary between individuals. Odour events may only last a few seconds, but could cause annoyance if they frequently recur or are perceived to be particularly offensive.

Construction

Assessment of Construction Dust

7.6.7 Identified sensitive receptors to dust soiling and PM₁₀ effects from construction works are detailed in Table 7.2. The area sensitive to dust soiling and PM₁₀ health effects has been

assessed, as detailed in Appendix 7A in PEI Report Volume III, from the sensitivity of receptors and the proximity of the Proposed Development activities to these receptors.

- 7.6.8 The Humber Estuary Ramsar site, SPA and SAC is greater than 50 m from the construction works associated with the Proposed Development, therefore an assessment of demolition and construction dust on ecological receptors has been screened out.
- 7.6.9 The scale and nature of activities have been estimated to define the potential uncontrolled dust generation magnitude, according to the criteria outlined in Appendix 7A, Table 7A.1 (refer to PEI Report III).
- 7.6.10 Whilst a detailed construction management plan has yet to be developed for the Proposed Development, estimates of the likely scale of activities, with reference to the guidance magnitude definitions in Table 7A.1 (refer to PEI Report Volume III) have been made for the purposes of mitigation definition:
- there are no structures that require demolition prior to the construction of the Proposed Development, therefore demolition has not been considered;
 - the earthworks will cover an area of approximately 7 ha, and may involve the export of approximately 160,000 tonnes of materials from the Site during part of the first year of construction;
 - an on-site concrete batching is likely to be employed for periods during the construction phase of the Proposed Development; and
 - Heavy Duty Vehicle movements associated with construction would be more than 50 vehicles per day at peak (Chapter 9: Traffic and Transport predicts 58 Heavy Goods Vehicles will visit the Site per day at the peak of construction).
- 7.6.11 According to IAQM criteria, the Site has been classified in terms of its potential for earthworks and construction activities to generate emissions of dust as a 'large' site. In terms of the potential for the trackout of mud onto local roads, the Proposed Development has been classed as a 'medium' site.
- 7.6.12 Potential dust impacts (pre-mitigation) have been assessed based on the receptor sensitivity and distance criteria outlined in Tables 7A.2 - 7A.4 (refer to Appendix 7A in PEI Report Volume III) using professional judgement. The area sensitivity has been judged to be 'low' for dust soiling impacts from all activities and 'medium' sensitivity for human health impacts from PM₁₀ releases from all activities, on account of the distance from the activity source to the receptors, and the existing low background concentration particulates (<24 µg/m³).
- 7.6.13 The potential risks from emissions from construction activities associated with the Proposed Development (i.e. not taking into account the impact avoidance measures set out in Section 7.5 above) have been defined with reference to the magnitude of the potential emission and the sensitivity of the impact area, in accordance with the classification defined in Appendix 7A, Table 7A.5. The results are shown in Table 7.12 below.

Table 7.12: Risk of dust and particulates impacts (pre-mitigation)

POTENTIAL IMPACT	RISK OF IMPACT FROM ACTIVITY			
	PRE-CONSTRUCTION DEMOLITION	EARTHWORKS	CONSTRUCTION	TRACKOUT
Dust Soiling	No demolition	Low risk	Low risk	Low risk
Human Health PM ₁₀	No demolition	Low risk	Low risk	Low risk
Ecology	No demolition	Not applicable	Not applicable	Not applicable

7.6.14 The level of mitigation required to reduce dust and particulates from the construction activities to avoid significant impacts on receptors has been determined based on the above risk assessment and indicative measures are outlined in Table 7.13 for the Proposed Development activities.

Table 7.13: Example mitigation for dust and particulates during construction phase

ACTIVITY	EXAMPLE MITIGATION BASED ON RISK LEVEL	CLASSIFICATION OF RESIDUAL RISK OF IMPACT	EFFECT DESCRIPTOR
Earthworks	Medium/ low risk: re-vegetate earthworks and any soil stockpiles to stabilise surfaces as soon as practicable; minimise working area and use temporary cover or damping down to minimise dust formation during dry and windy conditions	Negligible	Not significant
Construction	Medium/ low risk: avoid mechanical roughening of concrete surfaces where possible; store sand and aggregates in bunded areas and finer materials in silos with suitable emission control systems	Negligible	Not significant
Trackout	Medium/ low risk: use water suppression and regular cleaning to minimise mud on road; cover vehicles leaving the site with spoil or waste materials; employ wheel wash systems at site exits; restrict unmade road access where possible	Negligible	Not significant

7.6.15 The application of good practice controls and mitigation regularly employed in the construction industry, along with the CEMP would reduce potential effects at receptors to a not significant level.

Assessment of Construction Traffic

7.6.16 Predicted annual mean concentrations of NO₂, PM₁₀ and PM_{2.5}, and the number of exceedances of the 24-hour 50 µg/m³ PM₁₀ air quality objective at the selected existing receptors in the 2021 Construction scenario are listed in Table 7.14.

Table 7.14: Air quality statistics predicted for 2021 construction scenario

ID	RECEPTOR NAME	ANNUAL MEAN POLLUTANT CONCENTRATION (µg/m ³)			NUMBER OF DAYS OF EXCEEDANCE OF 24-HOUR MEAN OF 50µG/M ³ (DAYS)
		NO ₂	PM ₁₀	PM _{2.5}	
R1	Mauxhall Farm	17.8	15.0	8.7	1
R2	Property on North Moss Lane	15.8	14.7	8.5	1
R3	Property on South Marsh Road	15.9	14.7	8.6	1
R4	Property on South Marsh Road	17.4	15.0	8.7	1
R5	Property on South Marsh Road	17.9	15.1	8.8	1
R6	Property on South Marsh Road	19.7	15.4	9.0	1
R7	Primrose Cottage, north of A180	21.9	15.8	9.2	1
R8	Cress Cottage, north of A180	24.4	16.3	9.5	1
R9	The Meadows, south of A180	18.1	15.1	8.8	1
R10	Meadows Farm, south of A180	16.2	14.8	8.6	1
R11	Meadows Cottages, south of A180	15.8	14.7	8.6	1
R12	Property on South Marsh Road in Stallingborough	16.3	14.8	8.6	1
R13	Property on Woad Lane in Grimsby	17.5	15.0	8.7	1
R14	Property on Kendal Road, Immingham	14.5	14.4	8.4	1
R15	Property on Hadleigh Road, Immingham	14.6	14.5	8.4	1
R16	Property on Arran Close, Immingham	15.5	14.6	8.5	1
R17	Property on Mull Way, Immingham	16.3	14.8	8.6	1
R18	Willows Court, Immingham	18.0	15.1	8.8	1
R19	Property north of Habrough	16.8	14.9	8.7	1

ID	RECEPTOR NAME	ANNUAL MEAN POLLUTANT CONCENTRATION ($\mu\text{g}/\text{m}^3$)			NUMBER OF DAYS OF EXCEEDANCE OF 24-HOUR MEAN OF $50\mu\text{G}/\text{M}^3$ (DAYS)
		NO ₂	PM ₁₀	PM _{2.5}	
R20	Property on Station Road in Habrough	26.0	16.6	9.7	1
R21	Grimsby AQMA	33.5	14.1	8.2	1

7.6.17 Predicted pollutant concentrations in the 2021 Construction scenario show that concentrations of all pollutants are below all NAQS values for all pollutants, indicating that air quality in the vicinity of the Proposed Development remains of a good quality.

7.6.18 The changes in air quality statistics between the 2021 future baseline and 2021 Construction scenarios are shown in Table 7.15.

Table 7.15: Air quality impacts predicted for 2021 construction scenario

ID	RECEPTOR NAME	ANNUAL MEAN POLLUTANT CONCENTRATION ($\mu\text{g}/\text{m}^3$)			NUMBER OF DAYS OF EXCEEDANCE OF 24-HOUR MEAN OF $50\mu\text{G}/\text{M}^3$ (DAYS)
		NO ₂	PM ₁₀	PM _{2.5}	
R1	Mauxhall Farm	+0.1	<0.1	<0.1	<1
R2	Property on North Moss Lane	<0.1	<0.1	<0.1	<1
R3	Property on South Marsh Road	<0.1	<0.1	<0.1	<1
R4	Property on South Marsh Road	<0.1	<0.1	<0.1	<1
R5	Property on South Marsh Road	<0.1	<0.1	<0.1	<1
R6	Property on South Marsh Road	<0.1	<0.1	<0.1	<1
R7	Primrose Cottage, north of A180	<0.1	<0.1	<0.1	<1
R8	Cress Cottage, north of A180	<0.1	<0.1	<0.1	<1
R9	The Meadows, south of A180	<0.1	<0.1	<0.1	<1
R10	Meadows Farm, south of A180	<0.1	<0.1	<0.1	<1
R11	Meadows Cottages, south of A180	<0.1	<0.1	<0.1	<1
R12	Property on South Marsh Road in Stallingborough	<0.1	<0.1	<0.1	<1
R13	Property on Woad Lane in Grimsby	<0.1	<0.1	<0.1	<1
R14	Property on Kendal Road, Immingham	<0.1	<0.1	<0.1	<1

ID	RECEPTOR NAME	ANNUAL MEAN POLLUTANT CONCENTRATION ($\mu\text{g}/\text{m}^3$)			NUMBER OF DAYS OF EXCEEDANCE OF 24-HOUR MEAN OF $50\mu\text{G}/\text{M}^3$ (DAYS)
		NO ₂	PM ₁₀	PM _{2.5}	
R15	Property on Hadleigh Road, Immingham	<0.1	<0.1	<0.1	<1
R16	Property on Arran Close, Immingham	<0.1	<0.1	<0.1	<1
R17	Property on Mull Way, Immingham	<0.1	<0.1	<0.1	<1
R18	Willows Court, Immingham	+0.1	<0.1	<0.1	<1
R19	Property north of Habrough	<0.1	<0.1	<0.1	<1
R20	Property on Station Road in Habrough	+0.3	<0.1	<0.1	<1
R21	Grimsby AQMA	<0.1	<0.1	<0.1	<1

7.6.19 The magnitude of the change in pollutant concentrations due to construction traffic on the road network associated with the Proposed Development is predicted to be imperceptible or very low for all pollutants at all receptor locations. A change of this magnitude is considered to have a negligible effect, which is considered to be not significant.

Operation

Assessment of Operational Emissions from the Proposed Development Stacks and Operational Road Traffic on NO₂ Concentrations

- 7.6.20 The impact of point source emissions at human health receptors has been determined from isopleth figures of pollutant dispersion and maximum model output at discrete receptor locations.
- 7.6.21 Of the pollutants emitted from the Proposed Development and road traffic, the primary pollutants of interest in relation to the impacts from road traffic emissions are nitrogen dioxide and particulate matter (PM₁₀ and PM_{2.5} size fractions), although the full suite of pollutants potentially emitted from the Proposed Development is assessed in Appendix 7A in PEI Report Volume III.
- 7.6.22 The maximum hourly, and annual mean predicted NO₂, PM₁₀ and PM_{2.5} concentrations have been compared with the NAQS objectives, as summarised in Tables 7.13 to 7.16 below; full concentrations are provided in Table 7A.13 in Appendix 7A in PEI Report Volume III. Isopleth figures showing the annual and hourly mean process contributions of NO₂ are provided in Figures 7.3 and 7.4 in PEI Report Volume II.
- 7.6.23 The assessment has been undertaken for the Proposed Development opening year scenario (2023). By assessing the effects of the Proposed Development being operational at the earliest possible opening year, a worst case background ambient air quality is assumed for the purposes of the operational impact assessment.

7.6.24 The dispersion modelling includes a number of conservative assumptions in combination, including:

- use of the worst case year of meteorological data modelled;
- operation of the plant at the proposed IED or BAT-AEL emission limits, whichever is tighter; in practice the actual operational emissions will have to be lower than these limits in order to ensure that the limits are adhered to; and
- conservative estimates of background concentrations at the sensitive receptors.

7.6.25 The following abbreviations are used in Table 7.16:

- PC: this is the Process Contribution and represents the change caused by the Proposed Development;
- PEC: this is the Predicted Environmental Concentration and is PC plus background concentration. It is the concentration expected at a particular receptor once the effect of the Proposed Development is taken into account; and
- Env Std: the relevant NAQS objective value or environmental standard.

Table 7.16: Maximum predicted long term NO₂ concentrations at human health receptors

RECEPTOR	2023 BASELINE SCENARIO	CHANGE DUE TO ROAD TRAFFIC	PC PROPOSED DEVELOPMENT STACKS	PC % ENV STD	PEC	PEC % ENV STD	EFFECT AT INDIVIDUAL RECEPTOR
R1	18.0	+0.2	+0.1	0.8	18.3	45.8	Negligible
R2	15.9	+0.2	+0.2	1.0	16.3	40.7	Negligible
R3	16.0	+0.2	+0.3	1.3	16.5	41.2	Negligible
R4	17.5	+0.2	+0.3	1.2	18.0	44.9	Negligible
R5	18.0	+0.2	+0.3	1.2	18.5	46.2	Negligible
R6	19.8	+0.3	+0.3	1.3	20.4	50.9	Negligible
R7	22.2	+0.3	+0.3	1.4	22.7	56.9	Negligible
R8	24.7	+0.4	+0.2	1.4	25.3	63.2	Negligible
R9	18.2	+0.2	+0.2	0.9	18.6	46.4	Negligible
R10	16.3	+0.1	+0.2	0.8	16.6	41.5	Negligible
R11	15.9	+0.1	+0.2	0.7	16.1	40.4	Negligible
R12	16.3	+0.2	+0.2	0.9	16.7	41.7	Negligible
R13	17.6	+0.1	+0.1	0.5	17.8	44.6	Negligible
R14	14.6	+<0.1	+0.1	0.4	14.7	36.8	Negligible
R15	14.7	+<0.1	+0.1	0.3	14.8	37.1	Negligible
R16	15.6	+<0.1	+0.1	0.4	15.7	39.3	Negligible
R17	16.4	+0.1	+0.1	0.4	16.6	41.5	Negligible
R18	18.2	+0.1	+0.1	0.4	18.3	45.8	Negligible
R19	16.9	+<0.1	+<0.1	0.3	17.1	42.6	Negligible
R20	26.4	+0.2	+<0.1	0.7	26.7	66.7	Negligible
R21	33.5	+<0.1	+0.1	0.2	33.6	83.9	Negligible

Table 7.17: Maximum predicted short term NO₂ concentrations at human health receptors

RECEPTOR ID	PC (µG/M ³)	PC % ENV STD	PC AS % OF HEADROOM	EFFECT AT INDIVIDUAL RECEPTOR
PROW 10	8.4	4.2	4.8	Negligible

Table 7.18: Maximum predicted long term PM₁₀ concentrations at human health receptors

RECEPTOR	2022 BASELINE SCENARIO	CHANGE DUE TO ROAD TRAFFIC	PC PROPOSED DEVELOPMENT STACKS	PC % ENV STD	PEC	PEC % ENV STD	EFFECT AT INDIVIDUAL RECEPTOR
R1	15.0	<0.1	<0.1	0.1	15.1	37.7	Negligible
R2	14.7	<0.1	<0.1	0.1	14.7	36.8	Negligible
R3	14.7	<0.1	<0.1	0.1	14.8	36.9	Negligible
R4	15.0	<0.1	<0.1	0.1	15.0	37.6	Negligible
R5	15.1	<0.1	<0.1	0.1	15.1	37.8	Negligible
R6	15.4	<0.1	<0.1	0.1	15.5	38.7	Negligible
R7	15.9	<0.1	<0.1	0.2	15.9	39.9	Negligible
R8	16.4	<0.1	<0.1	0.2	16.4	41.1	Negligible
R9	15.1	<0.1	<0.1	0.1	15.2	37.9	Negligible
R10	14.8	<0.1	<0.1	0.1	14.8	37.0	Negligible
R11	14.7	<0.1	<0.1	0.1	14.7	36.8	Negligible
R12	14.8	<0.1	<0.1	0.1	14.8	37.0	Negligible
R13	15.0	<0.1	<0.1	0.1	15.1	37.6	Negligible
R14	14.5	<0.1	<0.1	0.0	14.5	36.2	Negligible
R15	14.5	<0.1	<0.1	0.0	14.5	36.3	Negligible
R16	14.6	<0.1	<0.1	0.0	14.7	36.7	Negligible
R17	14.8	<0.1	<0.1	0.1	14.8	37.1	Negligible
R18	15.1	<0.1	<0.1	0.1	15.2	37.9	Negligible
R19	14.9	<0.1	<0.1	0.0	14.9	37.3	Negligible
R20	16.7	<0.1	<0.1	0.1	16.8	42.0	Negligible

RECEPTOR	2022 BASELINE SCENARIO	CHANGE DUE TO ROAD TRAFFIC	PC PROPOSED DEVELOPMENT STACKS	PC % ENV STD	PEC	PEC % ENV STD	EFFECT AT INDIVIDUAL RECEPTOR
R21	14.1	<0.1	<0.1	0.0	14.1	35.4	Negligible

Table 7.19: Maximum predicted long term PM_{2.5} concentrations at human health receptors

RECEPTOR	2022 BASELINE SCENARIO	CHANGE DUE TO ROAD TRAFFIC	PC PROPOSED DEVELOPMENT STACKS	PC % ENV STD	PEC	PEC % ENV STD	EFFECT AT INDIVIDUAL RECEPTOR
R1	8.8	<0.1	<0.1	0.1	8.8	35.2	Negligible
R2	8.6	<0.1	<0.1	0.1	8.6	34.3	Negligible
R3	8.6	<0.1	<0.1	0.1	8.6	34.4	Negligible
R4	8.7	<0.1	<0.1	0.1	8.8	35.1	Negligible
R5	8.8	<0.1	<0.1	0.1	8.8	35.3	Negligible
R6	9.0	<0.1	<0.1	0.1	9.0	36.1	Negligible
R7	9.3	<0.1	<0.1	0.1	9.3	37.3	Negligible
R8	9.6	<0.1	<0.1	0.1	9.6	38.4	Negligible
R9	8.8	<0.1	<0.1	0.1	8.8	35.4	Negligible
R10	8.6	<0.1	<0.1	0.1	8.6	34.5	Negligible
R11	8.6	<0.1	<0.1	0.1	8.6	34.3	Negligible
R12	8.6	<0.1	<0.1	0.1	8.6	34.5	Negligible
R13	8.8	<0.1	<0.1	0.1	8.8	35.1	Negligible
R14	8.4	<0.1	<0.1	<0.1	8.4	33.7	Negligible
R15	8.4	<0.1	<0.1	<0.1	8.4	33.8	Negligible
R16	8.5	<0.1	<0.1	<0.1	8.5	34.2	Negligible
R17	8.6	<0.1	<0.1	<0.1	8.6	34.5	Negligible
R18	8.8	<0.1	<0.1	<0.1	8.8	35.3	Negligible
R19	8.7	<0.1	<0.1	<0.1	8.7	34.8	Negligible
R20	9.8	<0.1	<0.1	0.1	9.8	39.3	Negligible
R21	8.2	<0.1	<0.1	<0.1	8.2	32.9	Negligible

- 7.6.26 The maximum long-term process contribution of NO₂ from the operational traffic and process emissions associated with the operation of the Proposed Development results in a very low to low magnitude of change to the annual mean concentration. The highest predicted change in annual mean NO₂ concentrations due to emissions from the stacks only is at R3 to R6 on South Marsh Lane. Predicted impacts at other receptors are lower. At the most affected receptors, the effect can be described as minor adverse, while at other human health receptors the impact of emissions can be described as having a negligible effect.
- 7.6.27 The magnitude of change in annual mean nitrogen dioxide concentration at the identified AQMA (represented by R21) from the Proposed Development is less than 0.5% of the NAQS objective, which is classed as an imperceptible change. The predicted annual mean concentration of NO₂ at these receptors is below the objective value. This can therefore be described as a negligible effect.
- 7.6.28 The maximum short-term (1 hour mean) predicted concentration of nitrogen dioxide at the worst affected receptor (PROW 10) represents 4.2% of the hourly mean NAQS objective and impacts are smaller in magnitude at all other receptors. The predicted changes to short term concentrations of NO₂ at any human health receptor would not result in the risk of exceedance of the air quality objective and can therefore be described as a negligible effect.
- 7.6.29 As described in the IAQM guidance (IAQM, 2017), the effect descriptors are applied to individual receptors and if the effect at a receptor is described as moderate or major it does not necessarily follow that the overall effect is significant. Given the worst-case assumptions made in the assessment, the magnitude of the predicted impacts and the predicted annual mean NO₂ concentrations with Proposed Development, it is considered unlikely that the Proposed Development will interfere with policies or plans in place to bring about sustained achievement of the air quality objectives values. The effect of NO_x emissions from the Proposed Development on NO₂ concentrations is considered to be overall **not significant**.

Impacts on Concentrations of Other Pollutants

- 7.6.30 For the majority of the other pollutants included within the scope of the modelling assessment (see Appendix 7A in PEI Report Volume III), the model predictions demonstrate that emissions from the stacks would result in very low magnitude changes to baseline pollutant concentrations. The model predictions were, however, based upon a modelling approach that used highly pessimistic assumptions, including that of industrial metals being emitted at 100% of the respective overall emission limit for each metal. This does not take into account that modern energy from waste plants typically emit metals at concentrations far below IED limits. Further analysis of potential impacts using current guidance (Defra, 2016) was therefore carried out, in order to refine the impact predictions. The further work considers potential impacts using a range of typical emission rates.
- 7.6.31 The further analysis confirmed that the original modelling at IED emission limits was highly conservative and concluded that the impact on annual mean concentrations of all the metals considered by the assessment would result in a **negligible effect (not significant)**. The results of the other pollutants can be found in the dispersion modelling report in Appendix 7A in PEI Report Volume III.

Impacts on Ecological Receptors

- 7.6.32 The impact of process contributions of point source emissions at ecological receptors has been determined from the maximum model output at discrete receptor locations. The process contribution to Critical Level values (predicted from operation of the plant at BAT-AEL ELVs) have been compared with Critical Level and Critical Load values at each of

the identified sensitive ecological receptors. As described at paragraph 7.3.40, Critical Levels are atmospheric concentrations and Critical Loads relate the pollutant deposition on the ground.

7.6.33 The significance of effects associated with emissions from the Proposed Development on designated nature conservation sites (in particular nitrogen oxides, ammonia (having impact through nutrient nitrogen and acid deposition) and sulphur dioxide) are discussed in Chapter 10: Ecology and Nature Conservation. In summary:

- in terms of NO_x and nutrient nitrogen deposition, at the closest sensitive receptor within the Humber Estuary designated site (an area of saltmarsh approximately 400 m south-east of the Site), the PC is predicted to exceed the 1% increase threshold, triggering further assessment, but the total NO_x and nutrient nitrogen deposition levels do not exceed the Critical Levels so no significant effects are anticipated;
- the 1% increase threshold is not exceeded for NO_x or nutrient nitrogen deposition at any of the other assessed receptor locations within the Humber Estuary designated site, so no further assessment was required and significant effects are predicted; and
- no exceedances of the 1% increase threshold are identified for acid deposition or sulphur dioxide at any of the assessed receptor locations within the Humber Estuary designated site, so no significant effects are predicted.

7.6.34 The assessment concludes that the Proposed Development will not give rise to significant adverse air quality effects on sensitive habitats within the Humber Estuary SPA/ SAC/ Ramsar site/ SSSI.

Emissions of Odour

7.6.35 Several potential odour release sources have been identified; predominantly around presence of the Refuse Derived Fuel (RDF). Some of the process residues, chemicals and reagents which are required to mitigate operational stack emissions are also a potential source of odour if experienced at high concentrations.

7.6.36 Odours from the storage of RDF will be contained within the main building due to the negative pressure maintained by drawing air from the fuel reception into the combustion process. Air from within the building envelope is used as feed air to the combustion plant, which ensures destruction of odorous compounds before they are emitted to atmosphere. During normal operations, therefore, odour emissions from the Proposed Development are unlikely to occur.

7.6.37 Other control measures to minimise odour include various good housekeeping measures including: the cleaning of storage areas on a regular basis, monitoring odour, storing flue gas treatment (FGT) residues in sealed containers, loading FGT residues to tankers using sealed systems, storing reagents in sealed containers, and recording and investigating odour issues. These measures represent BAT for the control of odours from the Proposed Development.

7.6.38 In the event that primary odour control measures (e.g. negative pressure and odour destruction by combustion) require additional support, odour suppression, including mist spray deodorising suppression systems would be implemented as necessary. Personnel will be trained in how and when to use the odour suppression system.

7.6.39 During planned maintenance, it is common for only one of the two lines to be shut down at a time, leaving the other line to draw feed air from within the building envelope. When both combustion lines need to be shut down, alternative mitigation can be implemented as outlined above.

- 7.6.40 Under normal operations, therefore, the containment measures built into the building design mean that fugitive odour emissions from the Proposed Development would be unlikely to be perceptible at locations outside of the Site boundary, which would not be significant.

Decommissioning and Demolition

- 7.6.41 The relevant best practice mitigation measures for the time will be in place during any decommissioning and demolition works, and the surrounding environment and receptors at the time of decommissioning will be identified through due process and documented in a Demolition Environmental Management Plan. No additional mitigation for decommissioning and demolition of the Proposed Development beyond such best practice is foreseen to be required at this stage. The predicted air quality effects of eventual decommissioning and demolition of the Proposed Development are considered to be comparable to – or less than – those assessed for construction activities.

Comparison of Proposed Development and Consented Development

- 7.6.42 The impacts and effects of the Proposed Development compared to a future baseline with the Consented Development are described below.

Construction

- 7.6.43 The construction activities associated with the Proposed Development are expected to be the same as that for the Consented Development, with appropriate construction management measures and mitigation implemented through a CEMP. Therefore the Proposed Development is predicted to have no additional construction dust or site plant emissions effects on receptors compared to the construction of the Consented Development.
- 7.6.44 As described in the TA (Appendix 9A PEI Report Volume III), the forecast construction traffic associated with the Proposed Development is the same as the forecast construction traffic associated with the Consented Development. In addition, the same methods for managing construction traffic (as set out in Section 9.5 of Chapter 9) are proposed for both the Consented Development and the Proposed Development. As such, the construction traffic for the Proposed Development is predicted to have no additional air quality impact compared to a future baseline with the construction of the Consented Development.

Operation

- 7.6.45 The stack emissions from the Proposed Development would be the same as the stack emissions from the Consented Development, and the stack heights are fixed at 102 m AOD for both developments. There would therefore be no additional effect on human or ecological receptors due to predicted ground level concentrations of air pollutants from stack emissions associated with the Proposed Development compared to a future baseline with the Consented Development stack emissions.
- 7.6.46 Similarly the forecast operational traffic associated with the Proposed Development is the same as the forecast operational traffic associated with the Consented Development so operational traffic noise for the Proposed Development is predicted to have no additional air quality effect compared to a future baseline with the operational traffic of the Consented Development.

Decommissioning

- 7.6.47 The nature and scale of decommissioning activities required for the Proposed Development are proposed to be the same as that for the Consented Development. As such, the decommissioning of the Proposed Development is predicted to have no

additional air quality effect compared to a future baseline with the decommissioning of the Consented Development.

7.7 Mitigation and Enhancement Measures

- 7.7.1 As described earlier, the management of dust and particulates and application of adequate mitigation measures will be enforced through the CEMP, and through application of appropriate mitigation according to the risk of dust emissions from Site activities as identified in this assessment.
- 7.7.2 The environmental effects from construction of the Proposed Development have been identified as not significant; therefore no specific additional mitigation has been identified as necessary for the construction phase of the Proposed Development other than the measures outlined in Section 7.5.
- 7.7.3 The air quality assessment of operational impacts has assumed that the ELVs will be met for the operational plant as required under the IED as amended by the revised BREF and in accordance with use of BAT under the environmental permitting regime. The environmental effects from operation of the Proposed Development have been identified as not significant at all human health receptors.
- 7.7.4 Detailed modelling of predicted impacts at ecological receptors indicates that potential effects at ecological receptors as a result of the operation of the Proposed Development cannot be completely screened out. Further assessment of the predicted effects at ecological receptors and the determination of the significance of these effects has therefore been undertaken – see Chapter 10: Ecology and Nature Conservation. This assessment concludes that the Proposed Development will give rise to no significant adverse air quality effects on sensitive habitats within the Humber Estuary SPA/ SAC/ Ramsar site/ SSSI.
- 7.7.5 No specific additional mitigation has therefore been identified as necessary for the operation or decommissioning phases of the Proposed Development, other than the embedded mitigation measured outlined in Section 7.5.

7.8 Limitations or Difficulties

- 7.8.1 No technical limitations or difficulties that could have implications for the assessment were encountered. The assessment presented in this Chapter utilises the data available and assesses a robust scenario for the likely effects of the Proposed Development.

7.9 Residual Effects and Conclusions

Construction

- 7.9.1 The air quality assessment of construction impacts assumes that the impact avoidance measures outlined within Section 7.5 will be incorporated into the design of the Proposed Development, as they are standard good practice measures that are routinely applied across UK construction sites. No specific additional mitigation has been identified as necessary for the construction phase of the Proposed Development. For this reason, the residual effects would be as reported within Section 7.6 of this chapter. No significant effects have been identified.

Operation

- 7.9.2 The air quality assessment of impacts at opening has assumed that the ELVs will be met for the operational plant as required and in accordance with use of BAT under the environmental permitting regime. No specific additional mitigation has been identified as necessary for the operational phase of the Proposed Development. For this reason, the

residual effects would be as reported within Section 7.6 of this chapter. No significant effects have been identified.

Decommissioning and Demolition

- 7.9.3 Consistent with construction mitigation, it has been assumed that relevant best practice mitigation measures would be in place during any decommissioning and demolition works. No specific additional mitigation has been identified as necessary for the decommissioning and demolition phase of the Proposed Development at this stage and no significant effects have been identified.

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8.0 NOISE AND VIBRATION

8.1 Introduction

8.1.1 This chapter of the Preliminary Environmental Information (PEI) Report presents an assessment of the potential environmental effects of the construction, operation (including maintenance) and decommissioning of the Proposed Development with respect to noise and vibration. This chapter also describes the methods used to assess the effects; the baseline conditions currently existing at the Site and surrounding area; the measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been adopted.

8.1.2 This chapter is supported by Figures 8.1 and 8.2 in PEI Report Volume II and Appendices 8A-8E in PEI Report Volume III.

8.2 Legislation and Planning Policy Context

Legislation

Environmental Protection Act 1990

8.2.1 The Environmental Protection Act 1990 (EPA) Part 3 prescribes noise (and vibration) emitted from premises (including land) so as to be prejudicial to health or a nuisance as a statutory nuisance.

8.2.2 Local Authorities are required to investigate any public complaints of noise and if they are satisfied that a statutory nuisance exists, or is likely to occur or recur, they may serve a noise abatement notice. A notice is served on the person responsible for the nuisance. It can require the abatement of the nuisance; works to abate the nuisance to be carried out; or prohibition restriction of the activity. Contravention of a notice without reasonable excuse is an offence.

8.2.3 In determining if a noise complaint amounts to a statutory nuisance the Local Authority can take account of various guidance documents and existing case law; no statutory noise limits exist. Demonstrating the use of 'Best Practicable Means' (BPM) to minimise noise levels is a defence in relation to the contravention of a noise abatement notice.

Control of Pollution Act 1974

8.2.4 Sections 60 and 61 of the Control of Pollution Act 1974 (CoPA) provide the main legislation regarding demolition and construction site noise and vibration. If noise complaints are received, a Section 60 notice may be issued by the local planning authority with instructions to cease work until specific conditions to reduce noise have been adopted.

8.2.5 Section 61 of the CoPA provides a means for applying for prior consent to carry out noise generating activities during construction. Once prior consent has been agreed under Section 61, a Section 60 notice cannot be served provided the agreed conditions are maintained on-site.

8.2.6 CoPA requires that BPM (as defined in Section 72 of CoPA) be adopted for construction noise on any given site. CoPA makes reference to British Standard (BS) 5228 (British Standards Institute (BSI), 2014a and b) as BPM.

Environmental Permitting Regulations 2016

8.2.7 The Environmental Permitting (England and Wales) Regulations 2016 require the application of Best Available Techniques (BAT) to activities performed within installations regulated by the legislation in order to manage the impact of these operations on the

surrounding environment. This therefore applies only to the operational period, not construction.

- 8.2.8 In terms of noise specifically, the selection of BAT is considered and balanced with releases to different environmental media (air, land and water) and due consideration is given to issues such as usage of energy and raw materials. Noise, therefore, cannot be considered in isolation from other impacts on the environment.
- 8.2.9 The definition of pollution includes “emissions which may be harmful to human health or the quality of the environment, cause offence to human senses or impair or interfere with amenities and other legitimate uses of the environment”. BAT is therefore likely to be similar, in practice, to the requirements of statutory nuisance legislation, such as the Control of Pollution Act 1974, which requires the use of BPM to prevent or minimise noise nuisance. In the case of noise, “offence of any human senses” may be judged by the likelihood of complaints. However, the lack of complaint should not necessarily imply the absence of a noise problem. In some cases it may be possible, and desirable, to reduce noise emissions still further at reasonable costs and this may therefore be BAT for noise emissions. Consequently, the aim of BAT should be to ensure that there is no reasonable cause for annoyance to persons beyond the installation boundary.
- 8.2.10 Guidance regarding Environmental Permitting and noise is available in the Environment Agency’s Integrated Pollution Prevention and Control (IPPC) H3 document ‘Horizontal Guidance for Noise Part 2 - Noise assessment and Control’ (Environment Agency, 2002a). ‘Horizontal Guidance for Noise Part 1 – Regulation and Permitting’ (Environment Agency, 2002b), which provided guidance relating to noise limits from industrial installations in terms of absolute rating levels and rating levels relative to background noise levels (as defined in BS 4142:1997 (now superseded)) was withdrawn in February 2016. Therefore industry wide noise limits no longer apply.

National Planning Policy

National Policy Statements

- 8.2.11 Section 5.11 of the Overarching National Policy Statement (NPS) for Energy (EN-1) (Department of Energy and Climate Change (DECC), 2011a) refers to the Government’s policy on noise within the Noise Policy Statement for England (discussed further below) and sets out requirements for noise and vibration assessment for Nationally Significant Infrastructure Projects such as the Proposed Development.
- 8.2.12 At paragraph 5.11.8, with regards decision making, NPS EN-1 states “The project should demonstrate good design through selection of the quietest cost-effective plant available; containment of noise within buildings wherever possible; optimisation of plant layout to minimise noise emissions; and, where possible, the use of landscaping, bunds or noise barriers to reduce noise transmission.” Section 8.5 describes the impact avoidance measures identified relevant to the Proposed Development.

National Planning Policy Framework (2019)

- 8.2.13 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities & Local Government (MHCLG), 2019) sets out the Government’s planning policies for England and how these are expected to be applied.
- 8.2.14 The planning system is required to contribute to and enhance the natural and local environment. Consequently, the aim is to prevent both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of noise pollution.
- 8.2.15 The NPPF states that planning policies and decisions should aim to:

- *“mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise from giving rise to significant adverse impacts on health and quality of life; and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason”.*

8.2.16 With regards to ‘adverse effects’ and ‘significant adverse effects’ the NPPF (2018) refers to the Noise Policy Statement for England Explanatory Note (NPSE) (Department for Environment, Food and Rural Affairs (Defra), 2010), which is described below.

Noise Policy Statement for England

8.2.17 The Noise Policy Statement for England (NPSE) (Defra, 2010) seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. The NPSE applies to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise.

8.2.18 The NPSE sets out the long term vision of the government’s noise policy, which is to:

“promote good health and a good quality of life through the effective management of noise within the context of policy on sustainable development”.

8.2.19 This long term vision is supported by three aims:

- *“avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvements of health and quality of life.”*

8.2.20 The long term policy vision and aims are designed to enable decisions to be made regarding what is an acceptable noise burden to place on society.

8.2.21 The ‘Explanatory Note’ within the NPSE provides further guidance on defining ‘significant adverse effects’ and ‘adverse effects’ using the concepts:

- No Observed Effect Level (NOEL) - the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established;
- Lowest Observable Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and
- Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.

8.2.22 The three aims can therefore be interpreted as follows:

- the first aim is to avoid noise levels above the SOAEL;
- the second aim considers situations where noise levels are between the LOAEL and SOAEL. In such circumstances, all reasonable steps should be taken to mitigate and minimise the effects. However, this does not mean that such adverse effects cannot occur; and
- the third aim seeks, where possible, to positively improve the health and quality of life through the pro-active management of noise whilst also taking account of the guiding principles of sustainable development. The Explanatory Note considers that the protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.

- 8.2.23 The NPSE recognises that it is not possible to have single objective noise-based measures that define the SOAEL, LOAEL and NOEL that are applicable to all sources of noise in all situations. The levels are likely to be different for different noise sources, receptors and at different times of the day.

Planning Practice Guidance

- 8.2.24 In March 2014, the Department for Communities and Local Government (DCLG) released its Planning Practice Guidance (PPG) web-based resource to support the NPPF (DCLG, 2014). The guidance at paragraph 003 (revision date July 2019) advises that local planning authorities should consider:

- whether or not a significant adverse effect is occurring or likely to occur;
- whether or not an adverse effect is occurring or likely to occur; and
- whether or not a good standard of amenity can be achieved.

- 8.2.25 This guidance introduced the additional concepts of NOAEL (No Observed Adverse Effect Level), and UAEL (Unacceptable Adverse Effect Level). Full details of the PPG on effects are provided in Table 8.1.

- 8.2.26 Factors to be considered in determining if noise is a concern are identified including the absolute noise level of the source, the existing ambient noise climate, time of day, frequency of occurrence, duration, character of the noise and cumulative impacts.

- 8.2.27 With particular regard to mitigating noise impacts on residential development the guidance highlights that impacts may be partially off-set if residents have access to a relatively quiet façade as part of their dwelling or a relatively quiet amenity space (private, shared or public).

Table 8.1: Planning Practice Guidance on noise exposure hierarchy (paragraph 005, revision date July 2019)

PERCEPTION	EXAMPLES OF OUTCOMES	INCREASING EFFECT LEVEL	ACTION
Not noticeable	No effect.	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported	Observed Adverse Effect	Mitigate and reduce to a minimum

PERCEPTION	EXAMPLES OF OUTCOMES	INCREASING EFFECT LEVEL	ACTION
	sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.		
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/ or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/ awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

Local Planning Policy

8.2.28 The North East Lincolnshire Local Plan 2013-2032 was adopted in March 2018 (North East Lincolnshire Council (NELC), 2018). The following policies from the Local Plan are considered relevant to the assessment of noise and vibration from the construction and operation of the Proposed Development:

- Policy 5 – Development boundaries; and
- Policy 47 – Future requirements for waste facilities.

Other Guidance

British Standard 7445-1:2003 and 7445-2:1991

8.2.29 BS 7445 'Description and measurement of environmental noise' (BSI, 1991 and 2003) defines parameters, procedures and instrumentation required for noise measurement and analysis.

British Standard 5228:2009+A1:2014

8.2.30 BS 5228-1 'Code of practice for noise and vibration control on construction and open sites. Noise' (BSI, 2014a) provides a 'best practice' guide for noise control, and includes Sound Power Level (L_w) data for individual plant as well as a calculation method for noise

from construction activities. BS 5228-2 'Code of practice for noise and vibration control on construction and open sites. Vibration' (BSI, 2014b) provides comparable 'best practice' for vibration control, including guidance on the human response to vibration.

British Standard 7385:1993

- 8.2.31 BS 7385-2 'Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration' (BSI, 1993) presents guide values for transient and continuous vibration, above which there is a likelihood of cosmetic damage. The standard establishes the basic principles for carrying out vibration measurements and processing the data, with regard to evaluating vibration effects on buildings.

British Standard 4142:2014

- 8.2.32 BS 4142 'Methods for rating and assessing industrial and commercial sound' (BSI, 2014) can be used for assessing the effect of noise of an industrial nature, including mechanical services plant noise. The method is based on a comparison between the 'rating level' of the industrial noise and the 'background level' at the receptor position.

World Health Organisation

- 8.2.33 The World Health Organisation's (WHO) 'Guidelines for Community Noise' (WHO, 1999) recommend external daytime and evening environmental noise limits, and internal night-time limits to avoid sleep disturbance.
- 8.2.34 The WHO 'Night Noise Guidelines for Europe' (WHO, 2009) recommend updated guidelines on night-time noise limits to avoid sleep disturbance.

Calculation of Road Traffic Noise

- 8.2.35 CRTN (DfT/ Welsh Office, 1988) describes procedures for traffic noise calculation, and is suitable for environmental assessments of schemes where road traffic noise may have an effect.

Design Manual for Road and Bridges

- 8.2.36 DMRB Volume 11 Section 3 Part 7 HD213/11 (Revision 1) Traffic Noise and Vibration (Highways Agency, 2011) provides guidance on the appropriate level of assessment to be used when assessing the noise and vibration effects arising from all road projects, including new construction, improvements and maintenance. The guidance can also be used for assessing changes in traffic noise levels as a result of non-road projects.

8.3 Assessment Methodology and Significance Criteria

Consultation

- 8.3.1 Consultation was carried out with the Environmental Health Department at NELC (both directly and through the formal EIA Scoping process for the Consented Development) to agree the measurement and assessment methodologies. The following was agreed:
- noise measurement locations and methodology;
 - that an assessment should be undertaken in accordance with BS 4142 and the Rating Level from noise from the operation of the Proposed Development should be no greater than 5 dB above the typical measured background noise level for daytime and night-time periods; and
 - that an assessment of noise impacts from the increase in road traffic flows on public roads as a result of the construction and operation of Proposed Development be undertaken using the methodologies given in the Calculation of Road Traffic Noise (CRTN) (Department for Transport (DfT)/ Welsh Office, 1998) and the Design Manual for Roads and Bridges (DMRB) (Highways Agency, 2011).

- 8.3.2 The Planning Inspectorate (PINS) has provided comments on the scope of the noise assessment within the EIA Scoping Opinion for the Proposed Development, received on the 2nd October 2019.
- 8.3.3 The consultation response by NELC to PINS explained that the EIA Scoping Report captured the relevant information requested by NELC in the scoping opinion in respect of the Consented Development and that NELC have no further comments.
- 8.3.4 The comments in PINS' EIA Scoping Opinion relevant to the noise and vibration assessment have been reviewed and a response provided in Table 8.2 below.

Table 8.2: EIA Scoping Opinion comments in relation to noise

COMMENT	RESPONSE
Operational ground vibration: The Scoping Report states that the Proposed Development is not likely to be a source of significant ground borne vibration and the only receptors within 500 m are industrial plants; any vibration from the Proposed Development would be negligible. However, as no evidence has been provided to support this statement, the Inspectorate is not in a position to agree to scope out these matters from the assessment. Accordingly, the ES should include an assessment of these matters where a likely significant environmental effect may occur.	The closest potential vibration sensitive premises to the Proposed Development are located approximately 50 m to the north at the Synthomer site and 85 m to the west at the existing South Humber Bank Power Station. All rotating equipment at the Proposed Development (steam turbine, centrifugal pumps and fans) will be isolated to reduce the transmission of vibration, and the sizing of duct and pipe work is such that harmonic vibration or water hammer should be minimised or avoided entirely. Therefore as no causes of significant ground borne vibration are known to be associated with the various operational activities that will be undertaken at the Proposed Development, significant operational vibration is not expected to occur at the closest non-residential properties.
Ecological receptors: The Scoping Report identifies several Local Wildlife Sites and Sites of Nature Conservation Importance in the vicinity of the Proposed Development (paragraphs 2.1.16 – 2.1.17) but does not explain if these sites would be affected by noise or vibration from the Proposed Development. The ES should provide a justification for the ecological and human receptors considered in the assessment.	The ecological receptors assessed in the Noise and Vibration chapter were included based on the findings of the ecological impact assessment presented in Chapter 10: Ecology. For human receptors, the closest residential properties to the Site and designated transport route were chosen as these would be the receptors that would have the greatest potential for noise and vibration effects.
Agreement with local authority Environmental Health Officer (EHO) on the scope of the assessment: The Applicant is advised to include evidence of any agreement with the local authority EHO in their ES.	A copy of the email correspondence relating to the Consented Development is provided in Appendix 8B. As the location and layout of the Proposed Development is very similar, the same scope of assessment has been undertaken. Consultation with the EHO will be

COMMENT	RESPONSE
	undertaken to confirm this for the final ES.
Noise Policy Statement for England: The ES should define No Observed Effect Levels, Lowest Observed Adverse Effect Levels and Significant Observed Adverse Effect Levels which are appropriate for the noise sources and sensitivity of receptors considered in the assessment.	LOAELs and SOEALs have now been incorporated into the Noise and Vibration chapter.

Determining Baseline Conditions and Noise Sensitive Receptors

Noise Monitoring Locations and Protocol

- 8.3.5 The location of potential noise sensitive receptors (NSRs) in proximity to the Site has been considered when assessing the effects associated with noise and vibration levels from the construction and operational phases of the Proposed Development.
- 8.3.6 Key NSR locations have been selected which are considered to be representative of the nearest and potentially most sensitive existing receptors to the Site.
- 8.3.7 Long-term unattended ambient noise monitoring was undertaken at three locations (Poplar Farm, Cress Cottage and South-eastern Site Boundary (Humber Estuary)) and attended short-term monitoring was undertaken at two further locations (Estuary edge along the wall bordering the Humber Estuary and Mauxhall Farm, Immingham) representative of residential NSR locations close to the Site and the Humber Estuary as an important ecological receptor located to the east. The noise monitoring locations and protocol were discussed in advance with NELC in respect of the Consented Development. The locations are given in Table 8.3 and are shown on Figure 8.1 in PEI Report Volume II.

Table 8.3: Monitoring locations

MONITORING LOCATION	ADDRESS	DETAILS
LT1	Poplar Farm, South Marsh Road	Located in the paddock to the north of Poplar Farm, approximately 1.35 km from the boundary of the Main Development Area.
LT2	Cress Cottage, Stallingborough	Located in corner of the garden to the north of Cress Cottage, approximately 1.52 km from the boundary of the Main Development Area. Representative of Cress Cottage, Field Cottage and Primrose Cottage.
LT3	South-eastern site boundary	Located along the south-eastern boundary of the Main Development Area, approximately 390 m from the existing South Humber Bank Power Station and 150 m from the existing cooling water pumping station.
ST1	Estuary edge	Along the wall bordering the Humber Estuary (Site of Special Scientific Interest (SSSI), Special Area of

MONITORING LOCATION	ADDRESS	DETAILS
		Conservation SAC, Special Protection Area (SPA), Ramsar site).
ST2	Mauxhall Farm, Immingham	Located to the north of the residential property at Mauxhall Farm, approximately 440 m from the A1173 and 380 m from the A180.

- 8.3.8 The long-term noise measurements were undertaken continuously between Wednesday 25th July and Wednesday 1st August 2018. Short-term attended noise measurements were undertaken during the day on Wednesday 25th July 2018. Noise measurements were undertaken using the methodology given in BS 7445-1: 2003. Further details relating to the noise monitoring are given in Appendix 8C in PEI Report Volume III.

Weather Conditions

- 8.3.9 Weather conditions during the long-term surveys were generally dry with low wind speeds. There were some periods of rain and thunderstorms; the data collected during these periods has been omitted from the monitoring results.

Impact Assessment and Significance Criteria

- 8.3.10 Effects are classified based on the magnitude of the impact and the sensitivity or value of the affected receptor. The criteria for assigning the magnitude of impacts are outlined below for the various potential impacts during construction and operation.

Assessment Scenarios and Parameters

- 8.3.11 As outlined in Chapter 5: Construction Programme and Management there are three construction programme scenarios being considered for the purposes of the EIA. Since the assessment of noise and vibration impacts during construction considers the different types of construction activities that would be required for all three construction programme scenarios, and the timing of construction is not relevant to the noise and vibration assessment of construction activities on Site, the assessment presented is relevant to all construction programme scenarios. For the assessment of construction traffic noise, the earlier construction programme scenario (with a peak of construction traffic in 2021) has been selected as the worst case, as the magnitude of impact would be greater compared to lower baseline traffic flows.
- 8.3.12 The assessment of noise and vibration impacts during operation of the Proposed Development considers the Rochdale Envelope (worst case) parameters for the Proposed Development layout, which is considered to represent a robust worst case for assessment.

Estimated Construction Noise Impacts

- 8.3.13 Before the appointment of a construction contractor, site specific details on the construction activities, programme and number or type of construction plant are not available. Indicative quantitative construction noise predictions have been undertaken using the calculation methods set out in BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' (BSI, 2014a), based upon information for similar construction projects. Noise emissions from a variety of anticipated construction activities, including drop hammer piling, have been predicted and assessed.
- 8.3.14 The calculation method provided in BS 5228 (BSI, 2014a) takes account of factors including the number and types of equipment operating, their associated Sound Power Levels (SWLs), their modes of operation (% on-times within the working period), the

distance to NSRs, and the effects of any intervening ground cover or barrier/topographical screening. This allows prediction of the magnitude of impact.

- 8.3.15 The subsequent assessment of construction noise 'effects' at residential NSRs (described in Section 8.5) is based on the guidance in 'example method 1 – the ABC method' as defined in BS 5228-1:2009+A1:2014 (BSI, 2014a). Table 8.4 (reproduced from BS 5228) provides guidance in terms of appropriate threshold values for residential NSRs, based upon existing ambient noise levels.

Table 8.4: Construction noise thresholds at residential dwellings

ASSESSMENT CATEGORY AND THRESHOLD VALUE PERIOD	THRESHOLD VALUE $L_{Aeq,T}$ DB(A) – FREE-FIELD		
	CATEGORY A (a)	CATEGORY B (b)	CATEGORY C (c)
Night-time (23:00 – 07:00)	45	50	55
Evenings and weekends (d)	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
<p>NOTE 1: A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the Site exceeds the threshold level for the category appropriate to the ambient noise level.</p> <p>NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise.</p> <p>NOTE 3: Applies to residential receptors only.</p>			
<p>(a) Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.</p> <p>(b) Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as Category A values.</p> <p>(c) Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than Category A values.</p> <p>(d) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays, 07:00 – 23:00 Sundays.</p>			

- 8.3.16 For the appropriate period (day, evening, night, weekend etc.), the ambient noise level is determined and rounded to the nearest 5 dB and the appropriate Threshold Value is then derived. The predicted construction noise level is then compared with this Threshold Value. Based upon this BS 5228 ABC method (BSI, 2014a), the criterion adopted in this assessment for the determination of the potential for likely significant effects is the exceedance of the $L_{Aeq,T}$ threshold level for the category appropriate to the ambient noise level at each NSR. This is considered to be potentially equivalent to the SOAEL, although as stated in BS 5228, other project-specific factors, such as the number of NSRs affected and the duration and character of the impact, should also be considered by the assessor when determining if there is a potentially significant effect. Similarly, the criterion for the LOAEL for this assessment is a predicted construction noise level equal to the existing ambient noise level at each NSR, i.e. resulting in a 3 dB increase in noise level when combined with the ambient noise level. Note that these criteria relate to residential NSRs only, in line with the ABC method set out in BS 5228.

- 8.3.17 In accordance with the NPPF (MHCLG, 2019) and NPSE (Defra, 2010), it is important to identify NSRs that exceed the LOAEL and ensure adverse effects are mitigated and minimised. The assessment focuses on the impact at existing residential NSRs.
- 8.3.18 Based upon the above, the magnitude of the impact of construction noise is classified in accordance with the descriptors in Table 8.5.

Table 8.5: Magnitude of construction noise impacts

MAGNITUDE OF IMPACT	L _{Aeq,T} dB (FAÇADE)
High	Exceedance of ABC Threshold Value by ≥5dB
Medium	Exceedance of ABC Threshold Value by up to 5dB
Low	Equal to or below the ABC Threshold Value by up to 5dB
Very Low	Below the ABC Threshold Value by ≥5dB

- 8.3.19 The criteria described above relate to impacts on human receptors. Impacts on ecological receptors cannot be assessed using the same criteria because ecological receptors have different responses to and effects from noise compared to humans. Sensitive ecological receptors are located at the Humber Estuary and at fields that are understood to be functionally linked to the Estuary located to the north and south of the Site (see receptors R3, R4 and R5, on Figure 8.1). The noise impacts on ecological receptors, including from piling during construction of the Proposed Development, are described in Section 8.6. The full assessment of effects on ecological receptors is described in Section 10.6 of Chapter 10: Ecology and also summarised in this chapter.

Assessment of Construction Vibration Effects

- 8.3.20 Vibration due to construction activities has the potential to result in impacts at nearby NSRs. The transmission of ground-borne vibration is highly dependent on the nature of the intervening ground between the source and receiver and the activities being undertaken. BS 5228-2: 2009+A1: 2014 'Code of Practice for Noise and Vibration Control on Construction and Open Sites - Vibration' (BSI, 2014b) provides data on measured levels of vibration for various construction works, with particular emphasis on piling. Impacts are considered for both damage to buildings and annoyance to occupiers.
- 8.3.21 With regards to annoyance, the magnitude of the impact of construction vibration from piling is classified with the descriptors in Table 8.6, taken from Table B.1 in BS 5228-2.

Table 8.6: Magnitude of construction vibration impacts

VIBRATION LEVEL PPV MMS⁻¹	EFFECT		MAGNITUDE OF IMPACT
10	Vibration is likely to be intolerable for any more than a brief exposure at this level.	Intolerable	High
1	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.	Complaints likely	Medium
0.3	Vibration might just be perceptible in residential environments	Just perceptible	Low
0.14	Vibration may be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Complaints unlikely	Very Low

- 8.3.22 For residential receptors and other high sensitivity receptors, the LOAEL is defined as a PPV (peak particle velocity) of 0.3 mm/s (millimetres per second), this being the point at which construction vibration is likely to become perceptible. The SOAEL is defined as a PPV of 1.0 mm/s, this being the level at which construction vibration can be tolerated with prior warning.
- 8.3.23 At receptors above the SOAEL, further consideration of whether an effect is significant is undertaken using professional judgment, taking account of the duration and frequency of the effect, as well as the time of day/ evening/ night that the effect would be experienced.
- 8.3.24 It has been assumed for the purposes of assessment that drop-hammer piling would be undertaken. This type of piling produces much higher levels of ground-borne vibration than other piling methods, such as Continuous Flight Auger (CFA) piling so is therefore considered to be a worst case for assessment.
- 8.3.25 Given the significant distance to residential receptors (>500 m), no significant vibration (medium or high magnitude impacts) is expected to result from the construction of the Proposed Development and therefore further assessment of vibration at residential receptors is scoped out.

- 8.3.26 Sensitive ecological receptors are located at the Humber Estuary and at fields that are understood to be functionally linked to the Estuary located to the north and south of the Site (see receptors R3, R4 and R5 on Figure 8.1), so vibration from piling works could affect ecological receptors. Vibration levels at the ecological areas have therefore been reported.

Assessment of Operational Noise from the Proposed Development

- 8.3.27 Predicted operational noise levels will be assessed using the methodology given in BS 4142. A key aspect of the BS 4142 assessment procedure is a comparison between the Background Sound Level in the vicinity of residential locations and the Rating Level of the sound source under consideration. The relevant parameters in this instance are as follows:

- Background Sound Level – $L_{A90,T}$ – defined in the Standard as the “*A-weighted sound pressure level that is exceeded by the residual sound for 90% of a given time interval, T , measured using time weighting F and quoted to the nearest whole number of decibels*”;
- Specific Sound Level – L_s ($L_{Aeq,Tr}$) – the “*equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr* ”; and
- Rating Level – $L_{Ar,Tr}$ – the “*specific sound level plus any adjustment made for the characteristic features of the sound*”.

- 8.3.28 BS 4142: 2014 allows for corrections to be applied based upon the presence or expected presence of the following:

- *tonality*: up to +6 dB penalty;
- *impulsivity*: up to +9 dB penalty (this can be summed with tonality penalty); and
- *other sound characteristics* (neither tonal or impulsive but still distinctive): + 3 dB penalty.

- 8.3.29 Once any adjustments have been made, the background sound level and the rating level are compared. The standard states that:

- “typically, the greater the difference, the greater the magnitude of impact;
- a difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending upon the context; and
- a difference of around +5 dB is likely to be an indication of an adverse impact, depending upon the context.”

- 8.3.30 The lower the rating level is to the measured background sound level, the less likely it is that the specific sound will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending upon the context.

- 8.3.31 Importantly, BS 4142:2014 (BSI, 2014) requires that the rating level of the noise source under assessment be considered in the context of the environment when defining the overall significance of the impact.

- 8.3.32 BS 4142:2014 (BSI, 2014) suggests that a one hour assessment period is considered during the day and a 15-minute assessment period at night.

- 8.3.33 Maintenance activities will be required periodically throughout the operational period, although such activities are not part of the ‘normal’ day to day operation of the Proposed

Development. Noise emissions from maintenance activities are expected to be lower than construction noise effects, so this is not specifically assessed in this Chapter. Similarly the predictions do not account for irregular emergency operations, such as boiler safety valves or steam turbine bypass valves in operation as such events will be infrequent.

- 8.3.34 Table 8.7 gives the adopted magnitude of impact scale used in this assessment based upon the numerical level difference. For BS 4142 assessment purposes the SOAEL is set at a rating level above the background sound level of +10 dB, and the LOAEL at +5 dB, although it should be remembered that the context assessment (including the absolute level of the sound under consideration) can vary the overall classification of effects.

Table 8.7: Magnitude of impact for industrial noise including building services

MAGNITUDE OF IMPACT	BS 4142 DESCRIPTOR	RATING LEVEL – BACKGROUND SOUND LEVEL (B)
High	No BS 4142 descriptor for this magnitude level	>15
Medium	Indication of a significant adverse effect, depending upon context	+10 approx.
Low	Indication of an adverse effect, depending upon context	+5 approx.
Very Low	Indication of low impact, depending upon context	≤ 0

- 8.3.35 As described above in relation to construction noise, the criteria described in Table 8.7 relate to impacts on human receptors. Impacts on ecological receptors cannot be assessed using the same criteria because ecological receptors have different responses to and effects from noise compared to humans. Therefore, whilst the noise impacts on ecological receptors are described in Section 8.6, the assessment of effects on ecological receptors is described in Chapter 10: Ecology and cross-referenced in this chapter.

Assessment of Operational Vibration

- 8.3.36 Based on experience of similar facilities, including the nature of the process equipment to be used during operation of the Proposed Development, the design which will incorporate measures to reduce transmission of vibration from rotating equipment, and due to the large distance between the Proposed Development and the closest residential NSRs (>1 km), the operation of the Proposed Development is unlikely to produce significant vibration levels at NSRs. Therefore, further assessment of operational vibration upon residential receptors is scoped out of this assessment.
- 8.3.37 The closest potential vibration sensitive premises are located approximately 50 m to the north of the Proposed Development at the Synthomer site. As no causes of significant vibration are known to be associated with the Proposed Development further assessment of operational vibration is scoped out of this assessment.

Assessment of Road Traffic Noise during Construction and Operation

- 8.3.38 There is potential for the Proposed Development to impact on traffic flows on existing roads in the area surrounding the Site during construction and operation.
- 8.3.39 Forecast construction and operational traffic movements have been provided from the transport assessment (see Chapter 9: Traffic and Transport) in the format 18 hour AAWT data for the construction year of 2020 for the 'with' and 'without' construction scenarios, and the operational year of 2023 for the scenarios of 'with' and 'without' the Proposed Development in place.
- 8.3.40 The road traffic data has been inputted into the prediction models to determine the construction and operational noise impact of changes in road traffic noise as a result of the Proposed Development.
- 8.3.41 The criteria for the assessment of traffic noise changes arising from construction and operational road traffic have been taken from Table 3.1 of DMRB (Highways Agency, 2011) and are provided in Table 8.8 below.

Table 8.8: Traffic noise criteria

MAGNITUDE OF IMPACT	CHANGE IN TRAFFIC NOISE LEVEL LA10,18H DB
High	≥ 5
Medium	3 to <5
Low	1 to <3
Very Low	<1

- 8.3.42 DMRB (Highways Agency, 2011) advises that an increase in road traffic flows of 25% (where the traffic speed and composition remain consistent) equates to an increase in road traffic noise of 1 dB(A). A doubling of road traffic flow would be required for an increase in 3 dB(A).
- 8.3.43 It is generally accepted that changes in noise levels of 1 dB(A) or less are imperceptible, and changes of 1 to 3 dB(A) are not widely perceptible. Consequently, at the selected road traffic noise receptors (receptors R1, R2 and R6 shown on Figure 8.1) the magnitude of the predicted change in noise levels uses the scale shown in Table 8.8. The criteria are based on the current guidance on short-term changes in traffic noise levels in DMRB. The SOAEL is set at a change in traffic noise of +3 dB and the LOAEL at +1 dB.
- 8.3.44 The Humber Estuary SPA/ SAC is approximately 385 m from the nearest road that will be used by Proposed Development traffic (i.e. the Site entrance) and therefore the assessment of road traffic impacts on ecological receptors has been scoped out.

Receptor Sensitivity

- 8.3.45 The sensitivity of existing receptors to noise (or vibration) impacts during either the construction or operational phases of the Proposed Development has been defined in Table 8.9.

Table 8.9: Sensitivity of receptors

SENSITIVITY	DESCRIPTION	EXAMPLES OF RECEPTOR
High	Receptors where people or operations are	Residential. Quiet outdoor areas used for recreation.

SENSITIVITY	DESCRIPTION	EXAMPLES OF RECEPTOR
	particularly susceptible to noise or vibration. Sensitive ecological receptors known to be vulnerable to the effects of noise or vibration.	Schools/ educational facilities in the daytime. Hospitals/ residential care homes. Ecologically sensitive areas for example Special Protection Areas (SPAs), Special Areas of Conservation (SAC) etc.
Medium	Receptors moderately sensitive to noise or vibration where it may cause some distraction or disturbance.	Offices. Restaurants/ retail. Sports grounds when spectator or noise is not a normal part of the event and where quiet conditions are necessary (e.g. tennis, golf).
Low	Receptors where distraction or disturbance of people from noise or vibration is minimal.	Residences and other buildings not occupied during working hours. Factories and working environments with existing high noise levels. Sports grounds when spectator or noise is a normal part of the event.

Significance of Effects

8.3.46 The following terminology has been used in the assessment to define effects:

- adverse – detrimental or negative effects to an environmental resource or receptor;
- neutral – effects to an environmental resource or receptor that are neither adverse nor beneficial; or
- beneficial – advantageous or positive effect to an environmental resource or receptor.

8.3.47 The effect resulting from each individual potential impact type above is classified according to the magnitude of the impact and the sensitivity or value of the affected receptor using the matrix presented in Table 8.10 below, but where necessary also considering the context of the acoustic environment e.g. existing noise sources in the area. This matrix is not the standard matrix set out in Chapter 2: Assessment Methodology because no receptors are classified as 'Very Low' sensitivity for the noise and vibration assessment.

Table 8.10: Classification of effects

SENSITIVITY OF RECEPTOR	MAGNITUDE OF IMPACT			
	HIGH	MEDIUM	LOW	VERY LOW
HIGH	Major	Moderate	Minor	Negligible
MEDIUM	Moderate	Minor	Negligible	Negligible
LOW	Minor	Negligible	Negligible	Negligible

- 8.3.48 Negligible and minor effects are considered to be not significant, whereas moderate and major effects are considered to be significant.

8.4 Baseline Conditions

Existing Baseline- Noise Survey Results

Long-term Monitoring Locations

- 8.4.1 The processed results from each noise survey position are provided in Tables 8.11 to 8.13 below. The L_{A90} values presented are the most frequently occurring 15-minute measurements within the specified time periods. Observations regarding the general baseline noise environment at each monitoring location are detailed after the tables. Further details on the noise monitoring are given in Appendix 8C.

Table 8.11: Measured noise level at LT1 – Poplar Farm

MONITORING LOCATION	DAY OF WEEK	TIME OF DAY	TIME PERIOD	$L_{Aeq,T}$ DB	TYPICAL $L_{A90,T}$ DB	L_{AFMAX} DB RANGE
LT1 – Poplar Farm	Monday - Friday	Day	07:00 – 23:00	54	47	51-87
		Day	09:00 – 10:00	53	48	56-82
		Night	23:00 – 07:00	52	41	49-88
		Night	06:00 – 07:00	57	54	57-71
	Saturday - Sunday	Day	07:00 – 23:00	55	50	58-82
		Day	09:00 – 10:00	56	51	62-80
		Night	23:00 – 07:00	52	43	56-87
		Night	06:00 – 07:00	52	50	60-65

Table 8.12: Measured noise level at LT2 – Cress Cottage

MONITORING LOCATION	DAY OF WEEK	TIME OF DAY	TIME PERIOD	L _{AEQ,T} DB	TYPICAL L _{A90,T} DB	L _{AFMAX} DB RANGE
LT2 – Cress Cottage	Monday - Friday	Day	07:00 – 23:00	65	62	58-97
		Day	09:00 – 10:00	63	59	67-75
		Night	23:00 – 07:00	60	42	59-86
		Night	06:00 – 07:00	65	62	68-78
	Saturday - Sunday	Day	07:00 – 23:00	67	65	72-81
		Day	09:00 – 10:00	65	61	73-77
		Night	23:00 – 07:00	61	52	67-80
		Night	06:00 – 07:00	64	58	75-77

Table 8.13: Measured noise level at LT3 – South-eastern Site boundary

MONITORING LOCATION	DAY OF WEEK	TIME OF DAY	TIME PERIOD	L _{AEQ,T} DB	TYPICAL L _{A90,T} DB	L _{AFMAX} DB RANGE
LT3 – South-eastern Site Boundary (Humber Estuary)	Monday - Friday	Day	07:00 – 23:00	53	45	46-84
		Day	09:00 – 10:00	48	43	53-83
		Night	23:00 – 07:00	50	44	44-83
		Night	06:00 – 07:00	50	48	51-81
	Saturday-Sunday	Day	07:00 – 23:00	51	48	47-77
		Day	09:00 – 10:00	51	45	53-72
		Night	23:00 – 07:00	49	45	49-69
		Night	06:00 – 07:00	47	45	50-65

Poplar Farm (LT1)

- 8.4.2 The dominant noise sources at this location during the daytime were noted to be distant road traffic noise from the A180 and traffic on local roads. Birdsong was also audible. At this location, noise from barking dogs close by occurred regularly. Whilst the existing South Humber Bank Power Station (SHBPS) was not audible, the background noise levels for the noise assessment at this location include the contribution of noise from the SHBPS.

Cress Cottage (LT2)

- 8.4.3 Noise at this location was observed to be dominated by road traffic noise from the A180. Whilst the operation of the SHBPS was not audible at this location, the background noise levels for the noise assessment include the contribution of noise from the SHBPS.

South-eastern Site Boundary (LT3)

- 8.4.4 Noise at this location was observed to be generally dominated by noise from the SHBPS, which was operating intermittently throughout the noise monitoring period. Noise from the pumping station associated with SHBPS and operations at the adjacent chemical plant (Synthomer) was also audible.

Estuary Edge (ST1)

- 8.4.5 The dominant noise source at the Estuary edge was waves breaking along the Estuary and birdsong. Distant broadband noise was also audible, possibly from the SHBPS pumping station or the neighbouring chemical plant. The background noise levels for the assessment at this location include the contribution of noise from the SHBPS. A comparison of the measured levels at the Site boundary (LT3) and at the Estuary edge (ST1) has been undertaken in order to estimate likely daytime and night-time noise levels along the Estuary edge, and are given in Table 8.14.

Table 8.14: Measured noise level at ST1 – Estuary edge

TIME	PARAMETER	SOUTH- EASTERN SITE BOUNDARY	ESTUARY WALL	DIFFERENCE DB	OBSERVATIONS/ NOTES
14:45	L _{Aeq,T} dB	44.0	54.4	10.4	Quad bike
15:00		44.7	48.8	4.1	
15:15		44.9	50.6	5.7	
15:30		45.2	54.5	9.3	Car turning 3 x motorbikes
14:45	L _{A90,15min} dB	42.3	46.3	4	Quad bike
15:00		42.6	47.1	4.5	
15:15		42.9	48.4	5.5	
15:30		43.3	50.9	7.6	Car turning 3 x motorbikes
14:45	Highest L _{AFmax,15min} dB	54.8	77.7	22.9	
15:00		51.3	61.2	9.9	Quad bike
15:15		53.1	62.7	9.6	
15:30		54.2	72.5	18.3	Car turning 3 x motorbikes

- 8.4.6 As indicated in Table 8.14, noise levels at the Estuary edge are higher than those at the Site boundary measurement location. Noise levels at the Estuary are regularly influenced by passing motor vehicles, in particular motorbikes. When there are no other additional noise sources influencing the noise climate at the Estuary edge, ambient and background levels are in the region of 5 dB higher at the Estuary edge than at the Site boundary monitoring location (LT3). Therefore, to determine the daytime and night-time noise levels at the Estuary edge, the measured levels at the Site boundary (LT3) have been increased by 5 dB to provide the baseline for this ecological receptor location. The resulting estimated ambient and background levels are given in Table 8.15.

Table 8.15: Estimated noise levels at Estuary edge

DAY OF WEEK	TIME OF DAY	TIME PERIOD	L _{AEQ,T} AT SITE BOUNDARY DB	ESTIMATED L _{AEQ,T} AT ESTUARY EDGE DB	TYPICAL L _{A90,T} AT SITE BOUNDARY DB	ESTIMATE L _{A90,T} AT ESTUARY EDGE DB
Monday - Friday	Day	07:00 – 23:00	53	58	57	62
	Day	09:00 – 10:00	48	53	43	48
	Night	23:00 – 07:00	50	55	45	50
	Night	06:00 – 07:00	50	55	48	53
Saturday-Sunday	Day	07:00 – 23:00	51	56	60	65
	Day	09:00 – 10:00	51	56	45	50
	Night	23:00 – 07:00	49	54	50	55
	Night	06:00 – 07:00	47	52	45	50

Mauxhall Farm (ST2)

- 8.4.7 There is the potential for increases in noise levels at Mauxhall Farm as a result of increases in road traffic flow once the Proposed Development is operational. Short-term attended noise monitoring was undertaken at Mauxhall Farm to determine the existing noise climate. Measured noise levels are given in Table 8.16.

Table 8.16: Measured noise level at ST2 – Mauxhall Farm

TIME OF DAY	TIME PERIOD	L _{AEQ,T} DB	L _{A90,15MIN} DB	HIGHEST L _{AFMAX,15MIN} DB
Day	07:00 – 23:00	50	47	75

- 8.4.8 Road traffic on the A180 dominated the noise climate at Mauxhall Farm. Other noise sources included farm vehicles in nearby fields and birdsong.

8.5 Development Design and Impact AvoidanceConstruction Noise

- 8.5.1 It is anticipated that the majority of construction works will be undertaken during the period Monday to Saturday, 07:00 to 19:00. Measures to reduce noise will be implemented where possible during the construction phase of the Proposed Development, particularly

with respect to any activities which are required to be carried out outside the proposed standard construction hours of 07:00 to 19.00 Monday to Saturday, such as concrete slip-forming during construction of the fuel bunker or non-noisy activities inside buildings. Where any on Site works are to be conducted outside the core working hours they will be undertaken within the noise threshold values given in Table 8.4 and any restrictions agreed with the local planning authority.

8.5.2 The construction contractor will follow Best Practicable Means to reduce the noise and vibration impacts to surrounding sensitive receptors. Best Practicable Means include the following (where practicable):

- all construction plant and equipment will comply with EU noise emission limits;
- proper use of plant with respect to minimising noise emissions – all vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good efficient working order;
- selection of inherently quiet plant where appropriate – for example and where practicable major compressors will be ‘sound reduced’ models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers;
- machines in intermittent use will be shut down in the intervening periods between work or throttled down to a minimum;
- materials should be handled with care and be placed, not dropped. Materials should be delivered during standard working hours where possible;
- all ancillary plant such as generators, compressors and pumps will be positioned so as to cause minimum noise disturbance, i.e. furthest from receptors or behind close boarded noise barriers; if necessary, acoustic enclosures will be provided and/or acoustic shielding; and
- construction contractors will be obliged to adhere to the codes of practice for construction working and piling given in BS 5228 and the guidance given therein minimising noise emissions from the Site.

Operational Noise

8.5.3 The Proposed Development will be operated in accordance with an Environmental Permit, issued and regulated by the Environment Agency. The Environmental Permit will require operational noise from the generating station within the Proposed Development to be controlled through the use of BAT.

8.6 Likely Impacts and Effects

Identification and Evaluation of Significant Effects

Sensitive Receptors

8.6.1 The NSRs for the construction and operational assessments are given in Table 8.17 below, and are presented on Figure 8.1 in PEI Report Volume II.

Table 8.17: Selected NSRs

RECEPTOR REFERENCE	DETAILS
R1	Poplar Farm bungalow, South Marsh Road

RECEPTOR REFERENCE	DETAILS
R2	Cress Cottage/ Field Cottage, Stallingborough
R3	Humber Estuary (SSSI, SAC, SPA, Ramsar)
R4	Field to the south of the site (non-statutory ecological receptor)
R5	Field to the north of the site (non-statutory ecological receptor)
R6	Mauxhall Farm, Immingham

Construction Noise and Vibration

8.6.2 This section discusses the potential noise and vibration effects on NSRs arising during the construction phase of the Proposed Development.

8.6.3 Noise levels experienced by NSRs during such works depend upon a number of variables, the most significant of which are:

- the noise generated by plant or equipment used on Site, generally expressed as Sound Power Levels (L_w) or the vibration generated by the plant;
- the periods of use of the plant on Site, known as its on-time;
- the distance between the noise/ vibration source and the NSR;
- the noise attenuation due to ground absorption, air absorption and barrier effects;
- in some instances, the reflection of noise due to the presence of hard surfaces such as the sides of buildings; and
- the time of day or night the works are undertaken.

8.6.4 Residential NSRs are located at distance to the west and south-west of the Site. The closest residential NSRs to the Site are Poplar Farm, approximately 1.35 km to the west and Field Cottage, approximately 1.52 km to the south-west (see Figure 8.1).

8.6.5 Due to the distance between the Site and Mauxhall Farm (>3 km) (see Figure 8.1), construction noise predictions have not been undertaken for this residential NSR.

8.6.6 The Humber Estuary Ramsar, SAC, SPA and SSSI is located to the north-east, with associated ecological receptor areas to the immediate north and south of the Site (fields used by water birds).

Construction Noise Emission Criteria

8.6.7 Based upon the analysis and summary of the results of the existing free-field baseline ambient noise surveys undertaken for the Proposed Development, Table 8.18 sets out the BS 5228 'ABC' noise threshold categories (BSI, 2014) at each NSR, as set out in Table 8.3.

Table 8.18: Measured free-field $L_{Aeq,T}$ noise levels and associated daytime 'ABC' assessment category

RECEPTOR	DAYTIME 07:00 – 19:00		
	AMBIENT NOISE LEVEL $L_{Aeq,T}$ DB*	ABC CATEGORY	DAYTIME CONSTRUCTION NOISE LIMIT $L_{Aeq,T}$ DB (FREE-FIELD)
R1 – Poplar Farm	54	A	65
R2 – Cress Cottage/ Field Cottage	65	A	70
R3 – Humber Estuary	58	N/A	N/A
R4 – Field to the south of the Site	53*	N/A	N/A
R5 – Field to the north of the Site	53*	N/A	N/A

* The ambient noise level at these locations has been assumed to be the same as those measured at monitoring location LT3.

Predicted Construction Noise Levels

- 8.6.8 Predicted noise levels for the construction of the Proposed Development have been based upon construction methods used for other similar developments. As a conservative approach, it is assumed that all plant and activities will be taking place at the closest approach to each NSR, whereas in reality this may not always be the case and, in any event, activities are unlikely to occur for any significant duration.
- 8.6.9 Full details on the noise prediction methodology, including a full list construction plant and associated sound power levels for each construction phase of the Proposed Development, are presented in Appendix 8D in PEI Report Volume III.
- 8.6.10 A summary of predicted noise levels at residential and ecological NSR locations around the Site are presented in Table 8.19. For residential receptors, free-field noise levels have been predicted to allow subsequent comparison with the ABC categories derived from free-field baseline ambient noise levels at NSRs. At ecological Receptors R4 (field to the south of the Site) and R5 (field to the north of the Site), a range of predicted noise levels have been given in Table 8.19 across these ecological receptor areas to inform the assessment of effects in Chapter 10: Ecology. Receptor R3 (Humber Estuary), Receptor R4 (field to south of the Site) and Receptor R5 (field to the north of the Site), are discussed after Table 8.21.

Table 8.19: Predicted construction noise levels

ACTIVITY	PREDICTED FREE-FIELD NOISE LEVEL FOR CONSTRUCTION ACTIVITY DB LAEQ,1H				
	R1	R2	R3	R4*	R5*
Site clearance	36	35	49	44-71	42-64
Earthworks	34	33	47	42-69	40-62
Drop hammer piling	48	48	62	55-71	54-74
Foundations	38	37	51	45-61	43-63
Slab construction	37	37	51	44-60	43-63
Building construction	37	36	50	43-60	42-62
Fitting out	35	35	49	42-58	41-61
Access roads & hardstanding	38	38	52	46-73	44-67

* predicted range of noise levels likely to be experienced across the ecological receptor area.

Construction Noise Effects

8.6.11 A comparison of the predicted noise levels at NSRs R1 and R2 with the daytime threshold values is given in Table 8.20.

Table 8.20: Predicted construction noise level above threshold value

ACTIVITY	R1			R2		
	PREDICTED LAEQ,1H DB	DAYTIME CONSTRUCTION LIMIT	LEVEL ABOVE LIMIT	PREDICTED LAEQ,1H DB	DAYTIME CONSTRUCTION LIMIT	LEVEL ABOVE LIMIT
Site clearance	36	65	-29	35	70	-35
Earthworks	34	65	-31	33	70	-37
Drop hammer piling	48	65	-17	48	70	-22
Foundations	38	65	-27	37	70	-33
Slab construction	37	65	-28	37	70	-33
Building construction	37	65	-28	36	70	-34
Fitting out	35	65	-30	35	70	-35
Access roads & car parking	38	65	-27	38	70	-32

- 8.6.12 The effects of the predicted daytime construction noise levels on NSRs R1 and R2 have been classified by considering the daytime ABC noise threshold values in Tables 8.18 and 8.20, and using the semantic scales in Tables 8.9 and 8.10. These effects are summarised in Table 8.21 below.

Table 8.21: Daytime construction noise effects

CONSTRUCTION ACTIVITY	R1	R2
Site clearance	Negligible adverse	Negligible adverse
Earthworks	Negligible adverse	Negligible adverse
Drop hammer piling	Negligible adverse	Negligible adverse
Foundations	Negligible adverse	Negligible adverse
Slab construction	Negligible adverse	Negligible adverse
Building construction	Negligible adverse	Negligible adverse
Fitting out	Negligible adverse	Negligible adverse
Access roads & car parking	Negligible adverse	Negligible adverse

- 8.6.13 Noise effects at all residential receptors during construction of the Proposed Development are predicted to be negligible adverse (not significant) during all construction activities during the daytime period. The predicted levels fall below the LOAEL of 54 dB $L_{Aeq,1h}$ at Receptor R1 and 65 dB $L_{Aeq,1h}$ at Receptor R2.
- 8.6.14 At Receptor R3 (Humber Estuary), predicted noise levels during all but one construction activity (drop hammer piling) fall below the daytime ambient noise level of 58 dB L_{Aeq} so no impact is predicted. During drop hammer piling works, noise levels at R3 are predicted to exceed the daytime ambient noise level by up to 4 dB. In addition, the type of noise being emitted by drop hammer piling (regular impulsive high noise levels) may be considered as more disturbing to birds. Considering the position of the birds (on mudflats behind the existing flood defence embankment), the ecological impact assessment considers the effect on birds to be minor adverse (not significant) (see Chapter 10: Ecology).
- 8.6.15 At the ecological Receptor areas R4 (field to the south of the Site) and R5 (field to the north of the Site), noise from construction works varies across each area depending on the proximity to the Site. At the parts of these fields (R4 and R5) closest to the Site, daytime ambient noise levels are exceeded by up to 21 dB. At the parts of these fields (R4 and R5) furthest from the Site, noise levels are predicted to fall below daytime ambient noise levels. The greatest noise impact at Receptor areas R4 and R5 is predicted to occur during piling works. The ecological impact assessment in Chapter 10: Ecology concludes that the majority of waterbirds will be located towards the central and eastern parts of the southern field (R4) where the effect of piling noise on birds at R4 is assessed to be moderate adverse (significant) if piling takes place within the winter months when the highest aggregations of waterbirds are present in the field (September to March inclusive). Mitigation of this potential effect is discussed further in Section 8.7, Chapter 10: Ecology Section 10.7, and Appendix 10G: Habitats Regulations Assessment Signposting Report (PEI Report Volume III). The ecological impact assessment concludes that the effect on waterbirds using the fields to the north of the Site (R5), where

the predicted piling noise levels are lower, will be minor adverse (not significant) even if piling takes place within the winter months (see Chapter 10: Ecology).

- 8.6.16 As described at paragraph 8.5.1, core construction working hours are expected to be between 07:00-19:00 Monday to Saturday. However, it is likely that some construction activities will be required to be 24 hours at certain times. Where any on Site works are to be conducted outside the core working hours they will be undertaken within the noise threshold values given in Table 8.4 and any restrictions agreed with the local planning authority.

Construction Traffic Noise

- 8.6.17 The predicted $L_{A10,18h}$ levels at the residential NSRs around the Site due to construction traffic on public roads are presented in Table 8.22.

Table 8.22: Road traffic noise - construction

RECEPTOR	FLOOR LEVEL	PREDICTED NOISE LEVELS FROM ROAD TRAFFIC		CHANGE IN $L_{A10,18H}$ AS A RESULT OF CONSTRUCTION TRAFFIC ON PUBLIC ROADS
		$L_{A10,18H}$ DB		
		2021 BASE + COMMITTED	2021 BASE + COMMITTED + CONSTRUCTION	
R1 – Poplar Farm	Ground	53.1	53.2	+0.1
R2 - Cress Cottage/ Field Cottage	Ground	59.0	59.0	+0.0
	First	60.8	60.8	+0.0
R6 – Mauxhall Farm	Ground	57.3	57.3	+0.0
	First	58.4	58.4	+0.0

- 8.6.18 The significance of effect of changes in road traffic noise levels is given in Table 8.23.

Table 8.23: Changes in road traffic levels during construction – significance of effect

RECEPTOR	FLOOR LEVEL	CHANGE IN ROAD TRAFFIC NOISE DB	MAGNITUDE OF IMPACT	RECEPTOR SENSITIVITY	CLASSIFICATION OF EFFECT
R1 – Poplar Farm	Ground	+0.1	Very low	High	Negligible adverse
R2 - Cress Cottage/ Field Cottage	Ground	+0.0	Very low	High	Negligible adverse
	First	+0.0	Very low	High	Negligible adverse

RECEPTOR	FLOOR LEVEL	CHANGE IN ROAD TRAFFIC NOISE DB	MAGNITUDE OF IMPACT	RECEPTOR SENSITIVITY	CLASSIFICATION OF EFFECT
R6 – Mauxhall Farm	Ground	+0.0	Very low	High	Negligible adverse
	First	+0.0	Very low	High	Negligible adverse

- 8.6.19 As shown in Table 8.23, the change in road traffic noise levels as a result of construction traffic during construction of the Proposed Development will result in negligible effects (not significant) at the selected residential NSRs. The resulting increase in noise levels from construction traffic falls below the LOAEL at all selected receptors.

Construction Vibration

- 8.6.20 It has been assumed for the purposes of a worst case assessment that drop-hammer piling will be required. This type of piling produces much higher levels of ground-borne vibration compared to other piling methods. However, given the significant distance to residential receptors (>500 m), no significant vibration (medium or high magnitude impacts) is expected to result from the construction of the Proposed Development at residential receptors. Vibration effects upon residential receptors are therefore not expected to exceed the LOAEL.
- 8.6.21 Sensitive receptors at the Humber Estuary and the fields located to the south and north of the Site may be adversely affected from vibration during piling. Estimated vibration levels at the Humber Estuary and ecological Receptor areas R4 (field south of the Site) and R5 (field north of the Site) are given in Table 8.24 below.

Table 8.24: Predicted vibration levels at ecological areas from drop-hammer piling

RECEPTOR	DISTANCE FROM PILING WORKS (M)	ESTIMATED VIBRATION LEVEL PPV MMS^{-1}	MAGNITUDE OF IMPACT	RECEPTOR SENSITIVITY	CLASSIFICATION OF EFFECT
R3 – Humber Estuary	500	0.34	Low	High	Minor adverse
R4 – field south of Site	100 - 615	<0.34 to 2.7	Low to Medium	High	Minor to moderate adverse
R5 – field north of Site	75 to 490	<0.34 to 4.3	Low to Medium	High	Minor to moderate adverse

- 8.6.22 The classification of vibration effects described in Table 8.24 above and discussed below is based on standards and guidance for human receptors in the absence of standards or guidance for assessment of vibration effects on ecological receptors.
- 8.6.23 The estimated vibration levels at the Humber Estuary are predicted to result in a low magnitude of impact, resulting in a minor adverse (not significant) effect. Although vibration levels may just be perceptible, vibration will be caused along the Estuary from the breaking of waves and will likely mask vibration incident along the Humber Estuary.
- 8.6.24 At Receptors R4 (field south of the Site) and R5 (field north of the Site), vibration levels at the closest part of the field to the piling works are estimated to result in a moderate adverse (significant) effect, and at locations further from the construction works, the significance of effect is estimated to be minor adverse (not significant). The effects of vibration from piling on birds using these fields will be the same as described for piling noise in paragraphs 8.6.13 and 8.6.14 above, and the mitigation is the same (see Section 8.7 and Chapter 10: Ecology).

Operational Noise

Operation of the Proposed Development

- 8.6.25 A noise propagation model has been developed in the SoundPLAN suite of programs to assess the effects of the Proposed Development. SoundPLAN implements the noise prediction method ISO 9613-2: 1996 'Attenuation of sound during propagation outdoors' (ISO, 1996), which has been employed to calculate noise levels at surrounding NSRs due to noise breakout from the proposed buildings and plant at the Proposed Development and also HGVs on Site during operation of the Proposed Development. The model consists of a detailed three-dimensional representation of the Proposed Development and surroundings, including existing buildings, residential receptors, topography and ground conditions.
- 8.6.26 The main sources of noise from the operation of the Proposed Development will be the air cooled condenser (ACC), emission stacks and other external fixed plant, as well as operational traffic. Noise breakout from the building itself, from the tipping of waste into the bunkers and operations inside the boiler and turbine halls, will also contribute to the overall emissions from the site but to a lesser extent.
- 8.6.27 Operational noise modelling has been undertaken for the Proposed Development for a number of scenarios, depending on operational traffic. These scenarios are:
- Scenario 1: worst-case hour during the day (09:00 – 10:00) (36 HGVs in, 34 HGVs out);
 - Scenario 2: worst-case hour at night (44 HGVs in, 43 HGVs out) (06:00 – 07:00); and
 - Scenario 3: typical one-hour at night (3 HGVs in, 3 HGVs out) (23:00 – 06:00)
- 8.6.28 Details of the settings used in the noise modelling software and information of the sound data and building fabric assumed are presented in Appendix 8E.

Operational Noise Levels at Residential Receptors

- 8.6.29 The predicted $L_{Aeq,1h}$ levels at the residential NSRs around the Site as a result of the operation of the Proposed Development are presented in Table 8.25.

Table 8.25: Predicted operational noise levels

RECEPTOR	FLOOR LEVEL	PREDICTED NOISE LEVELS FROM OPERATION $L_{AEQ,1H}$ DB		
		SCENARIO 1: WORST-CASE HOUR – DAY (09:00 – 10:00)	SCENARIO 2: WORST-CASE HOUR – NIGHT (06:00 – 07:00)	SCENARIO 3: TYPICAL HOUR - NIGHT (23:00 – 06:00)
R1 – Poplar Farm	Ground	35	35	35
R2 – Cress Cottage/ Field Cottage	Ground	34	-	-
	First	-	35	34

- 8.6.30 The BS 4142 assessments for NSRs R1 and R2 are presented in Table 8.26 for the closest residential receptors during the worst-case hour during the day (Scenario 1). A penalty of 3 dB has been added to the specific sound level to determine the Rating Level to account for intermittency as a result of HGV arrivals and departures.
- 8.6.31 In addition, the magnitude of impact and effect classification has been included based upon the BS 4142 assessment outcomes, with reference to the semantic scales in Tables 8.8 and 8.9. The representative background sound levels used are those presented in Tables 8.11 and 8.12, to present an assessment against existing baseline conditions.

Table 8.26: BS 4142 assessment - Scenario 1: worst-case hour daytime 09:00-10:00

RECEPTOR	R1 – POPLAR FARM	R2 – CRESS COTTAGE/ FIELD COTTAGE
Specific Sound Level $L_s (L_{Aeq,Tr})$, dB	35	34
Acoustic feature correction, dB	+3	+3
Rating Level ($L_{Ar,Tr}$), dB	38	37
Representative Background Sound Level ($L_{A90,T}$), dB	48	59
Excess of rating level over background sound level ($L_{Ar,Tr} - L_{A90,T}$), dB	-10	-22
BS 4142:2014 assessment outcome	Low impact	Low impact
Magnitude of impact	Very low	Very low
Classification of effect	Negligible adverse	Negligible adverse

8.6.32 During the worst-case hour during the daytime, effects are categorised as negligible adverse (not significant) for both NSRs, with no specifically designed mitigation in place. The predicted noise levels at NSRs remains below the LOAEL (+5 dB) at all NSRs.

8.6.33 The BS 4142 assessment for the worst-case hour at night (Scenario 2) is presented in Table 8.27. A penalty of 3 dB has been added to the specific sound level to determine the Rating Level to account for intermittency as a result of HGV arrivals and departures.

Table 8.27: BS 4142 assessment - Scenario 2: worst-case hour night-time 06:00-07:00

RECEPTOR	R1 – POPLAR FARM	R2 – CRESS COTTAGE/ FIELD COTTAGE
Specific Sound Level L _s (L _{Aeq,Tr}), dB	35	35
Acoustic feature correction, dB	+3	+3
Rating Level (L _{Ar,Tr}), dB	38	38
Representative Background Sound Level (L _{A90,T}), dB	50	58
Excess of rating level over background sound level (L _{Ar,Tr} - L _{A90,T}), dB	-12	-20
BS 4142:2014 assessment outcome	Low impact	Low impact
Magnitude of impact	Very low	Very low
Classification of effect	Negligible adverse	Negligible adverse

- 8.6.34 During the worst-case hour at night (06:00 – 07:00), effects are categorised as negligible adverse (not significant) for both NSRs, with no specifically designed mitigation in place. The predicted noise levels at NSRs remains below the LOAEL (+5 dB) at all NSRs.
- 8.6.35 The BS 4142 assessment for a typical hour at night with 6 HGV movements (Scenario 3) is presented in Table 8.28. A penalty of 3 dB has been added to the specific sound level to determine the Rating Level to account for intermittency as a result of HGV arrivals and departures.

Table 8.28: BS 4142 assessment - Scenario 3: typical hour night-time 23:00-06:00

RECEPTOR	R1 – POPLAR FARM	R2 – CRESS COTTAGE/ FIELD COTTAGE
Specific Sound Level L _s (L _{Aeq,Tr}), dB	35	34
Acoustic feature correction, dB	+3	+3
Rating Level (L _{Ar,Tr}), dB	38	37
Representative Background Sound Level (L _{A90,T}), dB	41	42
Excess of rating level over background sound level (L _{Ar,Tr} - L _{A90,T}), dB	-3	-5
BS 4142:2014 assessment outcome	Low impact	Low impact
Magnitude of impact	Very low	Very low
Classification of effect	Negligible adverse	Negligible adverse

- 8.6.36 During the night-time period when there will be a small number of deliveries of waste (23:00 – 06:00), effects are categorised as negligible adverse (not significant) for both NSRs, with no specifically designed mitigation in place. The predicted noise levels at NSRs remains below the LOAEL (+5 dB) at all NSRs.
- 8.6.37 Given that operation of the Proposed Development will be 24 hours, provided that noise levels are acceptable during the worst-case night-time hour of 06:00 – 07:00 (when the Proposed Development is fully operational and there is the greatest predicted number of HGV movements), they will be acceptable during the daytime period when existing ambient noise levels are higher.
- 8.6.38 It is noted that in addition to the normal operation of the Proposed Development, there may be some abnormal operational activities resulting in loud but short durations of noise, such as from steam blowing. Typically, local residents are informed of when these infrequent activities are to take place and no significant effects are anticipated.

Operational Noise Levels at Ecological Sites

- 8.6.39 Predicted operational noise levels at ecological sites close to the Proposed Development (R3- Humber Estuary, R4- field to south of the Site and R5- field to north of the Site) during the three operational scenarios are given in Tables 8.29 to 8.31. A noise contour map illustrating predicted noise levels at the Humber Estuary and the fields to the north and south of the Site during the worst-case night-time hour of 06:00 – 07:00 are given in Figure 8.2 in PEI Report Volume II.

Table 8.29: Predicted operational noise levels: R3 – Humber Estuary

RECEPTOR R3	PREDICTED NOISE LEVELS FROM OPERATION $L_{Aeq,1h}$ dB		
	SCENARIO 1: WORST-CASE HOUR – DAY (09:00 – 10:00)	SCENARIO 2: WORST-CASE HOUR – NIGHT (06:00 – 07:00)	SCENARIO 3: TYPICAL-CASE HOUR – NIGHT (23:00 – 06:00)
Predicted noise level $L_{Aeq,T}$ dB	47	47	46
Ambient noise level $L_{Aeq,T}$ dB	53	52	54
Ambient + Predicted $L_{Aeq,T}$ dB	54	53	55
Increase in ambient dB	+1	+1	+1

Table 8.30: Predicted operational noise levels: R4 – field to south of the Site

RECEPTOR R4	PREDICTED NOISE LEVELS FROM OPERATION $L_{Aeq,1h}$ dB		
	SCENARIO 1: WORST-CASE HOUR – DAY (09:00 – 10:00)	SCENARIO 2: WORST-CASE HOUR – NIGHT (06:00 – 07:00)	SCENARIO 3: TYPICAL-CASE HOUR – NIGHT (23:00 – 06:00)
Predicted noise level $L_{Aeq,T}$ dB	45-61	45-62	44-56
Ambient noise level $L_{Aeq,T}$ dB	48	50	50
Ambient + Predicted $L_{Aeq,T}$ dB	50-61	51-63	51-57
Increase in ambient dB	+2 to +13	+1 to +13	+1 to +7

Table 8.31: Predicted operational noise levels: R5 – field to north of the Site

RECEPTOR R5	PREDICTED NOISE LEVELS FROM OPERATION $L_{Aeq,1h}$ dB		
	SCENARIO 1: WORST-CASE HOUR – DAY (09:00 – 10:00)	SCENARIO 2: WORST-CASE HOUR – NIGHT (06:00 – 07:00)	SCENARIO 3: TYPICAL-CASE HOUR – NIGHT (23:00 – 06:00)
Predicted noise level $L_{Aeq,T}$ dB	41-59	41-60	40-58
Ambient noise level $L_{Aeq,T}$ dB*	48	50	50
Ambient + Predicted $L_{Aeq,T}$ dB	49-60	51-60	50-59
Increase in ambient dB	+1 to +12	+1 to +10	0 to +9

* For a worst-case assessment, ambient noise levels at this Receptor are assumed to be the same as at R4.

- 8.6.40 At Receptor R3 (Humber Estuary), predicted noise levels are 5 dB below the weekend ambient noise level of 52 dB L_{Aeq} during the worst-case hour at night (06:00 – 07:00). This results in an increase in the ambient level of no more than 1 dB. The assessment in Chapter 10: Ecology therefore concludes that there will be no effect on Receptor R3.
- 8.6.41 At the closest parts of Receptors R4 (field to the south of the Site) and R5 (field to the north of the Site), noise impacts from the operation of the Proposed Development are predicted to be greater due to proximity. As expected, at locations closest to the Proposed Development, noise levels are higher than at locations located further away.
- 8.6.42 The increase in the ambient noise level across the fields to the south of the Site (R4) is predicted to be between 1 dB and 7 dB during the night (when there are fewer HGV movements) and between 2 dB and 13 dB during the day. During the worst-case night-time hour (06:00 – 07:00) when the number of HGVs entering and leaving the Site is predicted to be at its highest, the ambient noise level is predicted to increase from between 1 and 13 dB. As discussed in Chapter 10: Ecology Section 10.6 (see paragraph 10.6.75), based on studies of the waterbird behaviour, waterbirds will tend to use parts of the field closest to the Estuary and away from field boundary features, which are further away from the Main Development Area; at these locations the noise levels will be similar to ambient levels, so the effect on waterbirds at R4 is considered to be neutral (not significant).
- 8.6.43 At Receptor R5 (the field north of the Site), noise from the operation of the Proposed Development is predicted to increase the ambient noise level between 1 and 9 dB during the night (when there are fewer HGV movements). During the day, and also during the hours of 06:00-07:00 (when there are a much larger number of HGV movements), ambient levels are expected to increase by between 1 and 12 dB. This is due to all vehicles entering and leaving the Site travelling from South Marsh Lane. As waterbirds will tend to use parts of the field away from field boundary features and therefore further away from the Main Development Area (see paragraph 8.6.37 above and Chapter 10: Ecology Section 10.6 paragraph 10.6.73), at these locations the noise impact will be

similar to ambient levels, so the effect on waterbirds is assessed in Chapter 10: Ecology to be neutral (not significant).

- 8.6.44 With regards to L_{AFmax} levels during operation of the Proposed Development, it is not expected that significant L_{AFmax} events will occur at the Site which will be audible along the Humber Estuary or at the fields located to the north and south of the Site (Receptors R4 and R5). The events that are likely to result in the highest L_{AFmax} levels are the tipping of waste into the bunker when it is delivered and the placing of waste into the shredder. As these activities are undertaken within the fuel reception hall and fuel bunker parts of the building, L_{AFmax} levels from these activities are unlikely to be audible at the Humber Estuary (R3) but may be just perceptible at the ecological Receptor areas to the north and south of the Site (R4 and R5).
- 8.6.45 In summary, the ecological impact assessment (see Chapter 10: Ecology Section 10.6) concludes that operational noise effects on Receptors R3, R4 and R5 will be neutral (not significant).

Changes in Operational Road Traffic Noise

- 8.6.46 Noise modelling has been undertaken to determine the change in road traffic noise levels as a result of the operation of the Proposed Development.
- 8.6.47 Details of the settings used in the noise modelling software are presented within Appendix 8E in PEI Report Volume III.
- 8.6.48 The predicted $L_{A10,18h}$ levels at the residential NSRs are presented in Table 8.32.

Table 8.32: Predicted noise levels with and without the Proposed Development

RECEPTOR	FLOOR LEVEL	PREDICTED NOISE LEVELS FROM ROAD TRAFFIC $L_{A10,18H}$ DB		CHANGE IN $L_{A10,18H}$ AS A RESULT OF THE OPERATION OF THE PROPOSED DEVELOPMENT
		2023 WITHOUT DEVELOPMENT	2023 WITH DEVELOPMENT	
R1 – Poplar Farm	Ground	53.2	53.3	+0.1
R2 - Cress Cottage/ Field Cottage	Ground	59.2	59.3	+0.1
	First	61.0	61.1	+0.1
R6 – Mauxhall Farm	Ground	57.5	57.7	+0.2
	First	58.7	58.9	+0.2

- 8.6.49 The classification of effect as a result of changes in road traffic noise levels is given in Table 8.33.

Table 8.33: Changes in road traffic levels – classification of effect

RECEPTOR	FLOOR LEVEL	CHANGE IN ROAD TRAFFIC NOISE DB	MAGNITUDE OF IMPACT	RECEPTOR SENSITIVITY	CLASSIFICATION OF EFFECT
R1 – Poplar Farm	Ground	+0.1	Very low	High	Negligible adverse
R2 - Cress Cottage/ Field Cottage	Ground	+0.1	Very low	High	Negligible adverse
	First	+0.1	Very low	High	Negligible adverse
R6 – Mauxhall Farm	Ground	+0.2	Very low	High	Negligible adverse
	First	+0.2	Very low	High	Negligible adverse

- 8.6.50 As shown in Table 8.33, the change in road traffic noise levels as a result of the operation of the Proposed Development will result in negligible adverse (not significant) effects at the selected residential receptors. The resulting increase in noise levels from operational traffic falls below the LOAEL at all selected receptors.

Decommissioning

- 8.6.51 Noise and vibration during decommissioning is expected to result in broadly similar levels of impacts and effects to those presented for the construction of the Proposed Development (with the exception of piling impacts, which will not occur during decommissioning). The potential impacts and effects would require further consideration at the decommissioning stage of the Proposed Development, but potential measures to ensure that appropriate mitigation is in place during the works are set out in Section 8.5 Development Design and Impact Avoidance.

Comparison of Proposed Development and Consented Development

- 8.6.52 The impacts and effects of the Proposed Development compared to a future baseline with the Consented Development are described below.

Construction Noise and Vibration

- 8.6.53 The construction activities associated with the Proposed Development are expected to be the same as that for the Consented Development. Therefore, the Proposed Development is predicted to have no additional noise and vibration impacts compared to the construction of the Consented Development.

Construction Traffic Noise

- 8.6.54 As described in Chapter 9: Traffic and Transport (see paragraph 9.6.59), the forecast construction traffic associated with the Proposed Development is the same as the forecast construction traffic associated with the Consented Development. In addition, the

same methods for managing construction traffic (as set out in Section 9.5 of Chapter 9) are proposed for both the Consented Development and the Proposed Development.

- 8.6.55 As such, the construction traffic for the Proposed Development is predicted to have no additional noise and vibration impact compared to a future baseline with the construction of the Consented Development.

Operational Noise from Activities on Site

- 8.6.56 Whilst the Proposed Development has a row of additional ACCs and other fixed plant, its operation will result in negligible increases in noise impacts than those predicted for the Consented Development. This is due to the dominant noise sources on the Site being HGVs entering, manoeuvring around and leaving the Site, the emission stacks and the other ACCs. In addition, the location of the additional ACCs is such that the main building will provide shielding of noise to residential receptors and the closest ecological receptor located to the north of the ACCs.

Operational Traffic Noise

- 8.6.57 The forecast operational traffic associated with the Proposed Development is the same as the forecast operational traffic associated with the Consented Development.
- 8.6.58 As such, operational traffic noise for the Proposed Development is predicted to have no additional noise and vibration impact compared to a future baseline with the operational traffic of the Consented Development.

Decommissioning

- 8.6.59 The nature and scale of decommissioning activities required for the Proposed Development are proposed to be the same as that for the Consented Development. As such, the decommissioning of the Proposed Development is predicted to have no additional noise and vibration impact compared to a future baseline with the decommissioning of the Consented Development.

8.7 Mitigation and Enhancement Measures

Construction

- 8.7.1 As no significant noise effects are predicted to occur during construction activities at residential receptors (R1, R2, and R6), no additional mitigation is required.
- 8.7.2 The assessment has predicted that during piling works, noise levels at the Humber Estuary and at the ecological areas located to the south and north of the Site (R4 and R5 respectively) will be higher than the ambient noise levels however this will be temporary in duration. The ecological impact assessment (Chapter 10: Ecology) concludes that the effect on waterbirds using the field to the south of the Site (Receptor R4) is potentially significant if hammer piling takes place in the winter months (September to March inclusive).
- 8.7.3 Mitigation is therefore required to avoid significant adverse effects on waterbirds using the field to the south of the Site (Receptor R4) during certain piling activities. Alternative piling methods may be used to reduce the noise impact, e.g. Continuous Flight Auger (CFA) piling. At R4, the residual effect using CFA piling would reduce to 62 dB at the closest part of the field to the Site (exceeding the ambient levels by up to 9 dB), and between 42 dB and 47 dB at locations in the field which are further from the Site (below the ambient levels), where birds are anticipated to be located as described in Chapter 10: Ecology, Section 10.6. In addition, the nature of the noise from CFA piling is less disturbing to birds as there is no impulsive noise.

- 8.7.4 Alternatively, seasonal restrictions on piling activities may be used to avoid impacts by not using drop hammer piling for two hours either side of high tide between September and March (inclusive) (see Chapter 10: Ecology, paragraph 10.7.2).
- 8.7.5 The piling noise mitigation measures to be employed during construction of the Proposed Development have not been fixed. This is as to allow the contractor to determine the best available technique for noise abatement during the piling works. However, a commitment to agree mitigation measures with North East Lincolnshire Council will be secured by way of a Requirement in Schedule 2 of the draft DCO.

Operation

- 8.7.6 A worst-case assessment has been undertaken and the resulting predicted levels fall well below background and ambient noise levels at human NSRs and no significant noise or vibration effects are predicted to occur as a consequence of the operation of the Proposed Development. Nevertheless, the following best practice methods to reduce noise impacts upon the closest NSRs will still be considered during the detailed design stage of the Proposed Development, including:
- the selection of quiet plant to reduce noise emissions;
 - the selection of external cladding that provides a minimum weighted sound reduction of 27 dB Rw;
 - the selection of louvres/ baffles that provide a minimum weighted sound reduction of 11 dB Rw;
 - the potential to design acoustically treated stacks – the stacks are the dominant source contributor to the overall noise levels, therefore providing acoustic attenuation to the stacks (which are assessed in Section 8.6 on the assumption of no attenuation being installed) will help to reduce the overall predicted noise levels, particularly to the Humber Estuary (R3) and other ecological receptors (R4 and R5); and
 - the potential to design cladding, louvres/baffles, silencers and air inlets to reduce tonal noise from the Proposed Development during its operation.

8.8 Limitations or Difficulties

- 8.8.1 Detailed construction information is not yet available as the contractor has not yet been appointed to construct the Proposed Development and therefore this assessment draws upon the experience of assessments undertaken from and using professional judgment and experience gained on similar developments.
- 8.8.2 Lists of assumptions made during the noise modelling and assessment of the Proposed Development are as presented within Appendix 8E in PEI Report Volume III. It is considered that the assumptions made will have led to a conservative ('worst case') assessment. The detailed design stage will ensure that appropriate noise limits are achieved at NSRs, and this will be secured through the environmental permit and Requirements in the DCO.

8.9 Residual Effects and Conclusions

Construction

- 8.9.1 During the construction of the Proposed Development, noise levels at the closest residential NSRs are predicted to fall well below the ambient noise levels. No significant effects on residential properties are predicted.
- 8.9.2 The use of alternative piling methods e.g. CFA piling are expected to reduce the noise to 50 dB $L_{Aeq,1h}$ to mitigate impacts on waterbirds in the fields to the south of the Site (R4).

This is up to 8 dB below the ambient noise level measured at the Site boundary. In addition, the nature of the noise from CFA piling is less disturbing to birds as there is no impulsive noise. Alternatively, seasonal restrictions on drop-hammer piling (piling restricted for two hours either side of high tide in the period September to March inclusive) could be used to avoid significant effects on waterbirds. Whilst the specific mitigation measures are not fixed at this stage, the commitment to implement appropriate mitigation (to be secured within Requirements within the DCO) reduces the moderate adverse (significant) effect at Receptor R4 (field to south of the Site) before mitigation to a residual minor adverse effect (not significant) (see Chapter 10: Ecology, paragraph 10.9.4).

- 8.9.3 Due to the distance to the nearest NSRs, vibration incident on residential properties from the construction of the Proposed Development has been scoped out. At the Humber Estuary (R3), vibration levels are estimated to be just perceptible, resulting in a minor adverse effect which is not significant, particularly when considered in the context of existing sources of vibration within the Estuary, such as waves. At the ecological areas to the north and south of the Site (Receptors R4 and R5), vibration levels from piling are estimated to be significant at the closest parts of the fields to the Site, but reduce with distance. The effects on birds using these fields have been assessed by the consideration of piling noise effects, and the vibration effects are considered to be the same. The use of alternative piling methods, such as CFA piling, is expected to result in vibration levels of approximately $0.08 \text{ ppv mms}^{-1}$, reducing the residual effect to negligible adverse (not significant), or alternatively the effects could be mitigated by seasonal restrictions on drop-hammer piling activities (by not using drop hammer piling for two hours either side of high tide between September and March (inclusive)) (see Chapter 10: Ecology Section 10.9).

Operation

- 8.9.4 During the operation of the Proposed Development, noise levels at the closest residential NSRs are predicted to fall well below the measured background noise levels. No significant noise effects are predicted.
- 8.9.5 At ecological receptors located along the Humber Estuary to the east, of the Site noise levels are predicted to fall below ambient noise levels during the operation of the Proposed Development and no significant effects are predicted.
- 8.9.6 At the ecological receptors located immediately north and south of the Proposed Development (R4 and R5), noise levels at the closest parts of the fields to the Site are predicted to exceed ambient noise levels during operation. The ecological impact assessment (see Chapter 10: Ecology, paragraphs 10.6.73 to 10.6.76) concludes that, as the majority of waterbirds will be located in the central and eastern parts of the fields to the south and central and northern parts of the fields to the north, the effects on waterbirds will be neutral (not significant).
- 8.9.7 Due to the nature of the Proposed Development (i.e. all rotating equipment at the Proposed Development will be isolated to reduce the transmission of vibration), vibration from the operation of the Proposed Development has been scoped out of the assessment.

Decommissioning

- 8.9.8 The nature of decommissioning works is anticipated to be similar to that of the construction works for the Proposed Development (with the exception of piling, which is not required for decommissioning). Therefore, noise levels at the closest NSRs are expected to fall below the ambient noise levels. No significant effects are predicted.

8.10 References

- British Standards Institute (1991) BS 7445-2 – Description and measurement of environmental noise. Guide to the acquisition of data pertinent to land use
- British Standards Institute (1993) BS 7385-2 – Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration
- British Standards Institute (2003) BS 7445-1 – Description and measurement of environmental noise. Guide to quantities and procedures
- British Standards Institute (2008) BS 6472-1 – Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting
- British Standards Institute (2014a) BS 5228-1:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites. Part 1: Noise.
- British Standards Institute (2014b) BS 5228-2:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites. Part 2: Vibration
- British Standards Institute (2014c) BS 4142 – Methods for rating and assessing industrial and commercial sound
- Ministry for Communities, Housing and Local Government (2018) *National Planning Policy Framework*. MHCLG, London
- Department for Communities and Local Government (2014) *Planning Practice Guidance*
- Department of Energy and Climate Change (2011a) Overarching National Policy Statement for Energy EN-1
- Department for Environment, Food and Rural Affairs (2010) *Noise Policy Statement for England (NPSE)*
- Department of Transport/ Welsh Office (1998) *Calculation of Road Traffic Noise (CRTN)*
- Environment Agency (2002a) Integrated Pollution Prevention and Control (IPPC) H3 document Horizontal Guidance for Noise Part 2 - Noise assessment and Control
- Environment Agency (2002b) Integrated Pollution Prevention and Control (IPPC) H3 document Horizontal Guidance for Noise Part 1 – Regulation and Permitting
- Highways Agency (2011) Design Manual for Road and Bridges Volume 11 Section 3 Part 7 HD213/11 (Revision 1) Traffic Noise and Vibration
- North East Lincolnshire Council (2018) North East Lincolnshire Local Plan 2013 to 2032
- World Health Organisation (WHO) (1999) *Guidelines for Community Noise*
- World Health Organisation (WHO) (2009) Night Noise Guidelines for Europe

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9.0 TRAFFIC AND TRANSPORT

9.1 Introduction

- 9.1.1 This chapter of the Preliminary Environmental Information (PEI) Report addresses the potential effects of the Proposed Development on traffic and transport during construction, operation (including maintenance) and decommissioning.
- 9.1.2 This chapter is supported by a Transport Assessment (TA) presented within Appendix 9A in PEI Report Volume III.

9.2 Legislation and Planning Policy Context

National Policy Statement for Energy (NPS EN-1)

- 9.2.1 The National Policy Statement (NPS) EN-1 was published in 2011 (Department for Energy and Climate Change (DECC), 2011). Section 5.13 outlines the planning policy for traffic and transport, including guidance on traffic and transport assessment as part of the Environmental Impact Assessment (EIA). The most relevant paragraphs for this transport assessment are paragraphs 5.13.2 to 5.13.4 which state:

“5.13.2 The consideration and mitigation of transport impacts is an essential part of Government’s wider policy objectives for sustainable development as set out in Section 2.2 of this NPS.

5.13.3 If a project is likely to have significant transport implications, the applicant’s ES (see Section 4.2) should include a transport assessment, using the NATA/ WebTAG139 methodology stipulated in Department for Transport guidance, or any successor to such methodology. Applicants should consult the Highways Agency and Highways Authorities as appropriate on the assessment and mitigation.

5.13.4 Where appropriate, the applicant should prepare a travel plan including demand management measures to mitigate transport impacts. The applicant should also provide details of proposed measures to improve access by public transport, walking and cycling, to reduce the need for parking associated with the proposal and to mitigate transport impacts.”

- 9.2.2 In terms of decision making, Section 5.13 of the NPS states that the Infrastructure Planning Commission (now Secretary of State) should ensure that the applicant has sought to mitigate the impacts on the surrounding road infrastructure that may occur as a result of a new energy nationally significant infrastructure project. Where the proposed mitigation measures are insufficient to reduce the impact on the transport infrastructure to acceptable levels, the Secretary of State should consider requirements to mitigate the adverse impacts on transport networks arising from the development and could include:

- demand management measures;
- water-borne or rail transport, where cost effective; and
- attaching requirements to a development consent order where there is likely to be substantial HGV traffic.

National Planning Policy Framework (July 2019)

- 9.2.3 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2019) sets out the Government’s planning policies for England.
- 9.2.4 The NPPF states that the transport system needs to be balanced in favour of sustainable transport modes, giving people a real choice about how to travel. The policy states that

local authorities should support a pattern of development, which, where reasonable to do so, facilitates the use of sustainable modes of transport. Plans and decisions should ensure that developments that generate significant movements are located where the need to travel will be minimised and the use of sustainable transport modes can be maximised.

- 9.2.5 The NPPF recommends that a Transport Statement (TS) or TA should support all developments that generate significant amounts of movement and that development should only be prevented or refused on transport grounds where the residual cumulative impacts of development are severe.

Local Planning Policy

North East Lincolnshire Local Plan 2013 to 2032 (adopted 2018)

- 9.2.6 The Local Plan was adopted by NELC in March 2018 and sets out the vision and objectives for the authority, allocates sites for housing, employment and other forms of development and sets out policies.
- 9.2.7 Key transport related policies relevant to the Proposed Development that form part of the Local Plan are summarised below.

Policy 36: Promoting Sustainable Transport

- 9.2.8 Policy 36 states that *“to reduce congestion, improve environmental quality and encourage more active and healthy lifestyles, the Council will support measures that promote more sustainable transport choices.”* The policy states that where appropriate, proposals should seek to:

- focus development which generates significant movements in locations where the need to travel will be minimised;
- prioritise pedestrian and cycle access to and within the site;
- make appropriate provision for access to public transport and other alternative means of transport to the car, adopting a 400 m walk to bus stop standard;
- make suitable provision to accommodate the efficient delivery of goods and supplies; and
- make suitable provision for electric vehicle charging, car clubs and car sharing when considering car park provision.

- 9.2.9 The policy goes on to state that *“planning permission will be granted where any development that is expected to have significant transport implications delivers necessary and cost effective mitigation measures to ensure that development has an acceptable impact on the network’s functioning and safety.”*
- 9.2.10 The policy also states that *“where appropriate, Transport Statements, Transport Assessments and/ or Travel Plans should be submitted with applications with the precise form being dependent on the scale and nature of development and agreed through early discussion with the Council”.*

Policy 38: Parking

- 9.2.11 Policy 38 states that *“Development proposals that generate additional parking demand should ensure that appropriate vehicle, powered two-wheeler and cycle parking provision is made. The form and scale of off-street parking required will be assessed against the following:*
- *the accessibility of the development;*

- *the type, mix and use of the development;*
- *the availability and frequency of public transport services; and*
- *local car ownership levels.”*

9.2.12 The policy states that developers should consider and incorporate measures to minimise parking provision without causing a detrimental impact to the functioning of the local highway network.

9.2.13 The policy goes on to state that at least 5% of parking bays should be allocated for people with mobility impairments.

North East Lincolnshire Local Transport Plan (2016 – 2032)

9.2.14 North East Lincolnshire’s Local Transport Plan sets out a programme for a wide range of improvements to local transport over the period 2016 to 2032 (NELC, 2016). The objectives of the plan include:

- enable sustainable growth through effective transport provision;
- improve journey times and reliability by reducing congestion;
- support regeneration and employment by connecting people to education, training and jobs;
- enable disadvantaged groups or people living in disadvantaged areas to connect with employment, healthcare, social and leisure opportunities;
- improve the health of individuals by encouraging and enabling more physically active travel;
- provide safe access and reduce the risk of loss, death or injury due to transport collisions or crime;
- improve the journey experience on the local transport network; and
- ensure that transport contributes to environmental excellence, including managing air quality and reducing transport-related greenhouse gas emissions.

9.2.15 Major local highways and transport improvement schemes within the immediate area to the Site include the South Humber Bank Link Road which received planning permission in September 2018.

Other Guidance

Planning Practice Guidance

9.2.16 Planning Practice Guidance titled ‘Travel plans, transport assessments and statements in decision taking’ was published in March 2014 on the Government planning guidance planning portal (DCLG, 2014) and has been used to inform the TA.

Guidelines for Environmental Assessment of Road Traffic

9.2.17 The ‘Guidelines for the Environmental Assessment of Road Traffic’ were published in 1993 by the Institute of Environmental Assessment (IEA). The guidelines provide a basis for a comprehensive and consistent approach to the appraisal of traffic and transport impacts. Extensive reference has been made to these Guidelines throughout the preparation of this chapter.

Department for Transport Circular 02/2013: The Strategic Road Network and the Delivery of Sustainable Development

- 9.2.18 Circular 02/2013 was published in September 2013 by the Department for Transport which sets out the way in which Highways England will engage with the development industry to deliver sustainable development and, thus, economic growth, whilst safeguarding the primary function and purpose of the strategic road network and has been used to inform the transport assessment.

The Strategic Road Network: Planning for the Future

- 9.2.19 The Strategic Road Network: Planning for the Future 'A guide to working with Highways England on Planning Matters' published by Highways England in September 2015 offers advice and information regarding the information it expects to see within a planning proposal and has been used to inform the transport assessment.

9.3 Assessment Methodology and Significance Criteria

- 9.3.1 The environmental impact of the Proposed Development generated traffic has been assessed with reference to the 'Guidelines for the Environmental Assessment of Road Traffic' published by the IEA (1993). In accordance with guidance noted in Section 9.2 above, issues including severance, driver delay, pedestrian amenity and delay, accidents and safety associated with the Proposed Development have been investigated and are reported below.
- 9.3.2 Any likely significant environmental effects relating to noise and vibration and air pollution, generated by traffic from the Proposed Development are considered respectively in Chapter 7: Air Quality and Chapter 8: Noise and Vibration of this PEI Report.

Extent of Study Area

- 9.3.3 The Study Area scope of this assessment has been defined by reference to the 'Guidelines for the Environmental Assessment of Road Traffic' (IEA, 1993). The guidelines set out two rules as follows:
- Rule 1 – include highway links where traffic flows are predicted to increase by more than 30% (or where the number of Heavy Goods Vehicles (HGVs) is predicted to increase by more than 30%); and
 - Rule 2 – include any other specifically sensitive areas where the traffic flow (or HGV component) are predicted to increase by more than 10%.
- 9.3.4 The road links that have been considered in determining if the above rules are satisfied, and which form the Study Area, are listed below and shown on Figure 3.2 in Appendix 9A (PEI Report Volume III):
- South Marsh Road (East of Hobson Way);
 - South Marsh Road (West of Hobson Way);
 - Hobson Way (North of South Marsh Road);
 - Kiln Lane;
 - A1173 (West of North Moss Lane); and
 - A1173 (North of A180).
- 9.3.5 This Study Area was agreed with North East Lincolnshire Council (NELC) and Highways England (HE) through the TA scoping process for the Consented Development in 2018. A copy of the TA scoping correspondence received from NELC and HE officers is included in Annex 1 of the TA in Appendix 9A. The level of traffic that will be generated

and the designated route for HGV traffic will be the same for either the Consented Development or the Proposed Development, so the same Study Area is considered to be appropriate for the Proposed Development TA. The Applicant will consult with NELC and HE to confirm this (see Table 9.3 below).

Sensitivity of Receptors

- 9.3.6 The sensitivity of a road or the immediate area through which it passes can be defined by the type of user groups who may use it. Vulnerable users will include the elderly and children. It is also necessary to consider footpath and cycle route networks that cross the roads within the Study Area.
- 9.3.7 A desktop exercise has been undertaken to classify the sensitivity of the routes within the Study Area. Table 9.1 below identifies the links, the assigned sensitivity rating and the justification:

Table 9.1: Sensitivity of receptors

LINK NO.	LINK DESCRIPTION	LINK SENSITIVITY	RATIONALE
1	South Marsh Road (East of Hobson Way)	Low	South Marsh Road is a 6.75 m wide single carriageway road which is street lit and is subject to a 40 mph speed limit. Any frontage development is industrial in nature. Given there are no pedestrian facilities along the road, the lack of origins and destinations within a 2 km walking catchment and no bus stops in the vicinity, it is considered that pedestrian movements on this section of South Marsh Road would be minimal. The road is promoted as a leisure cycle route (known as Fishermen and Ships) by NELC.
2	South Marsh Road (West of Hobson Way)	Low	The road is a single lane carriageway for the majority of the route with passing places provided between Hobson Way and North Moss Lane. The road passes through open country. There are no pedestrian facilities along the road. The road is promoted as a leisure cycle route (known as Fishermen and Ships) by NELC.
3	Hobson Way (North of South Marsh Road)	Low	Hobson Way is a 7.3 m wide single carriageway road which is street lit and is subject to a 40 mph speed limit. A pedestrian footway is provided along the western side of the carriageway between Hobson Way and Kiln Lane. Any frontage development is industrial in nature.
4	Kiln Lane	Low	Kiln Lane is a 7.3 m wide single carriageway road which is street lit and is subject to a 40 mph speed limit. Kiln Lane provides access to a number of

LINK NO.	LINK DESCRIPTION	LINK SENSITIVITY	RATIONALE
			industrial units which are located along its frontage. A pedestrian footway is provided along the southern side of the carriageway between Hobson Way and the railway level crossing.
5	A1173 (West of North Moss Lane)	Very Low	The A1173 is a 7.3 m wide single carriageway road which is street lit and is subject to a 40 mph speed limit. There are no pedestrian footways along the road. Any frontage development is industrial in nature.
6	A1173 (North of A180)	Very Low	The A1173 between the A180 and the first roundabout passes through open county. It is a 7.3 m wide single carriageway road and is subject to the 60 mph national speed limit for single carriageway roads. There are no pedestrian footways along the road.

- 9.3.8 Traffic impacts on the A180 have not been assessed due to development traffic representing a very low percentage of total traffic on the A180, which does not trigger the rule threshold guidelines. There are also no sensitive receptors along the A180 in the vicinity of the Study Area (i.e. between the A1173/ A180 Stallingborough Interchange junction and the A180/ Moody Lane/ Pyewipe Road (Westgate Roundabout)).

Assessment Scenarios and Parameters

- 9.3.9 The IEA assessment guidelines document (IEA, 1993) is recognised as the industry standard methodology for the assessment of traffic and highway impacts. The guidelines outline the issues and the respective changes in volume and composition of traffic regarded as necessary before each issue results in traffic and transport impacts.
- 9.3.10 As described in Chapter 4: The Proposed Development, there are a number of possible construction programme scenarios for the Proposed Development. The most likely construction programme is currently anticipated to be the construction of the Consented Development pursuant to the Planning Permission starting in Quarter 1 (Q1) 2020 and taking approximately three years to complete, with the additional aspects of the Proposed Development also being constructed within the same construction period, following the grant of the Development Consent Order (DCO) (potentially beginning in Q3 2021, approximately half way through the construction programme for the Consented Development).
- 9.3.11 The other potential construction programme scenarios that are considered for the purposes of the EIA are:
- construction of the Proposed Development in a single circa three year construction phase commencing shortly after the DCO is awarded in Q3 2021 (with no construction pursuant to the Planning Permission); or
 - construction of the Proposed Development in a single circa three-year construction phase commencing up to five years after the DCO is awarded, in Q3 2026 (again, with no construction pursuant to the Planning Permission).
- 9.3.12 For the purposes of the TA (in terms of highway/ junction capacity), the worst case scenario would be the latest construction start date (2026) because baseline traffic flows

would be higher. However, for the purposes of this PEI Report the earliest construction start date (2020) and the latest construction start date (2026) have both been assessed for completeness. If construction starts in Q1 2020, before the final Environmental Statement (ES) and TA are completed for the DCO application, the later construction scenarios will be discounted.

9.3.13 The assessment scenarios are therefore:

- Construction – assuming for assessment purposes that construction starts in either Q1 2020 or Q3 2026; and
- Opening (start of Operation) – assuming for TA purposes that operation commences in either Q1 2023 or Q3 2029.

9.3.14 Decommissioning has also been considered as part of the assessment.

9.3.15 A number of worst case development parameters are assessed in terms of operational traffic, namely an average fuel net calorific value (NCV) at the lowest end of the operational range (9 MJ/kg) for the expected plant annual running hours, resulting in a maximum annual fuel throughput of 753,500 tonnes, and an average HGV payload of 16 tonnes.

9.3.16 In addition, although 24 hour operational fuel deliveries are proposed, it is assumed for the purposes of the traffic and transport assessment that all deliveries are between 06:00 and 18:00, to provide a worst case in terms of peak hourly traffic flows.

Assessment of Severance

9.3.17 Severance occurs in a community when a major road separates people from places and other people. Severance occurs from difficulty of crossing a road or where the road itself creates a physical barrier. Severance can be caused to pedestrians and motorists.

9.3.18 The Guidelines (IEA, 1993) suggest that changes in total traffic flow of 30%, 60% and 90% will result in slight, moderate and substantial changes in severance respectively.

Assessment of Pedestrian Amenity

9.3.19 Pedestrian amenity is broadly defined as the relative pleasantness of a journey, and is considered to be affected by traffic flow, traffic composition, pavement width and separation between vehicles and pedestrians. The impact manifests itself in fear and intimidation, exposure to noise and exposure to vehicle emissions.

9.3.20 The Guidelines (IEA, 1993) suggest that a doubling or halving of total traffic flow or the HGV composition could lead to perceptible negative or positive impacts upon pedestrian amenity.

Assessment of Fear and Intimidation

9.3.21 The volume of traffic and its HGV composition are the factors that contribute to fear and intimidation. In the absence of thresholds set out in the guidance, this report considers that changes in total traffic flow of 30%, 60% and 90% are considered to result in slight, moderate or substantial impacts.

Assessment of Highway Safety

9.3.22 Highway safety is assessed by the frequency and severity of injury accidents that are attended by the police and recorded in official accident statistics. Intensification of use or changes in the composition of traffic have the potential to have an effect on the collision rates.

9.3.23 Recent collision statistics on routes within the Study Area have been examined to highlight any hotspots that need further consideration.

Assessment of Driver Delay

- 9.3.24 The use of industry standard junction capacity modelling programs provides a methodology to quantify junction delay. Driver delay is only likely to be significant where the existing Study Area highway network is at or close to capacity.

Significance Criteria

- 9.3.25 Using the information set out above, the magnitude of impacts is defined as set out in Table 9.2.

Table 9.2: Traffic and transport assessment framework

TYPE OF IMPACT	MAGNITUDE OF IMPACT			
	Very Low	Low	Medium	High
Severance	Change in total traffic flow of <30%	Change in total traffic flow of 30% to 60%	Change in total traffic flow of 60% to 90%	Change in total traffic flow of >90%
Pedestrian Amenity	Change in traffic flow (or HGV component) <50%	Change in traffic flow (or HGV component) of 51% to 100%	Change in traffic flow (or HGV component) of 101% to 150%	Change in traffic flow (or HGV component) of >151%
Fear and Intimidation	Change in total traffic flow of <30%	Change in total traffic flow of 30% to 60%	Change in total traffic flow of 60% to 90%	Change in total traffic flow of >90%
Highway Safety	Magnitude of impact derived using professional judgement informed by the frequency and severity of collisions within the Study Area and the forecast increase in traffic			
Driver Delay	Magnitude of impact derived using professional judgement informed by the increase in vehicle delay and whether a junction is at, or close to capacity.			

- 9.3.26 The effects are classified by combining the receptor sensitivity with the magnitude of impact using the assessment matrix as outlined in Chapter 2: Assessment Methodology.

Sources of Information/ Data

- 9.3.27 As set out in further detail in the TA (Appendix 9A in PEI Report Volume III), a series of 7-day automated traffic counts (ATCs) were undertaken in June 2018 and September 2018 at the following locations to provide a baseline for comparison on the following roads:

- South Marsh Road (East of Hobson Way);
- South Marsh Road (West of Hobson Way);
- Hobson Way (North of South Marsh Road);
- Kiln Lane (West of Hobson Way);
- A1173 (West of North Moss Lane); and
- A1173 (North of A180).

9.3.28 In addition to the ATC counts, the impact of the Proposed Development has been examined at the following junctions on the local highway network for the overall network morning (AM) and evening (PM) peak hours:

- South Marsh Road/ Hobson Way;
- Hobson Way/ Laporte Road/ Kiln Lane;
- Kiln Lane/ North Moss Lane/ Trondheim Way;
- A1173/ Kiln Lane;
- A1173 / SHIP Site Access;
- A1173/ A180 Stallingborough Interchange; and
- A180/ Moody Lane/ Pyewipe Road (Westgate Roundabout).

9.3.29 The junction counts were undertaken on Thursday 7th June 2018 apart from the A1173/ A180 Stallingborough Interchange which was undertaken on Wednesday 5th July 2017 and the Kiln Lane/ North Moss Lane/ Trondheim Way Roundabout and the Westgate Roundabout which were undertaken on Thursday 11th October 2018. The surveys were undertaken between 07:00 and 10:00 and 16:00 and 19:00 hours.

9.3.30 As the traffic data is less than three years old, the data is valid for the purposes of assessment.

Consultation

9.3.31 A summary of the consultation responses specific to traffic and transport that have been received is provided in Table 9.3 below. This includes consultation that was undertaken on the Consented Development, which is considered to be relevant given that both developments would have the same traffic impacts.

9.3.32 The consultation response by NELC to PINS regarding the Proposed Development EIA Scoping Report explained that the EIA Scoping Report captured the relevant information requested by NELC in the scoping opinion in respect of the Consented Development and that NELC have no further comments.

Table 9.3: Consultation summary

CONSUL-TEE	DATE (METHOD OF CONSUL-TATION)	SUMMARY OF CONSULTEE COMMENTS	SUMMARY OF RESPONSE/ HOW COMMENTS HAVE BEEN ADDRESSED
Highways England	July 2018 (formal response to Consented Development EIA Scoping Report)	It is noted that no junctions on the Strategic Road Network (SRN) have been included within the Study Area, and as such, justification is required as to this omission.	A historic count has been obtained for the A180 Stallingborough Interchange dated July 2017.
		Given that the EIA identifies that the SRN needs to be considered during the construction and operation phases, the SRN should be considered within the Study Area.	This is noted. Full details provided within the TA (Appendix 9A in PEI Report Volume III).

CONSUL-TEE	DATE (METHOD OF CONSUL-TATION)	SUMMARY OF CONSULTEE COMMENTS	SUMMARY OF RESPONSE/ HOW COMMENTS HAVE BEEN ADDRESSED
		More precise information on construction traffic and operational traffic will be required within the TA.	This is noted. Full details provided within the TA (Appendix 9A in PEI Report Volume III).
		The TA should pay due cognisance to the requirements of Circular 02/2013.	This is noted and referenced in the TA (Appendix 9A in PEI Report Volume III).
		It is considered that the proposed link road – Planning application reference: DM/0094/18/FUL – from Hobson Way to Moody Lane should be considered within the Study Area as the link road will impact upon the distribution of trips to and from the development proposals.	The South Humber Bank Link Road TA prepared by Atkins in January 2018 stated that the Link Road will result in a redistribution of trips to/ from the areas at either end of the proposed Link Road. The effect of the proposed Link Road would be additional road capacity at the A180/ A1173 interchange and therefore it is not considered that any assessment with the proposed Link Road in place is considered necessary. A sensitivity test with the Link Road open is included in the TA (Appendix 9A in PEI Report Volume III).
Highways England	September 2018 (email response to TA scoping report for the Consented Development)	A 2028 assessment year should be provided for completeness.	A future Operation scenario is included in the TA (Appendix 9A in PEI Report Volume III) but not in the Traffic and Transport chapter as the Opening year is considered to be the worst case for EIA. This is due to lower baseline flows in the Opening year when compared to the future Operation year so the Proposed Development traffic represents a higher percentage impact in the Opening year compared to the future Operation year.

CONSUL-TEE	DATE (METHOD OF CONSUL-TATION)	SUMMARY OF CONSULTEE COMMENTS	SUMMARY OF RESPONSE/ HOW COMMENTS HAVE BEEN ADDRESSED
		Committed development information should be provided through liaison with the local planning authority.	This is noted. The list of committed developments will remain under review until the TA and ES are finalised in early 2020.
North East Lincolnshire Council	September 2018 (email response to TA scoping report for the Consented Development)	We would expect the Transport Assessment to be structured in the following way: Executive Summary; Introduction; Policy Context; Baseline Data; Details of Construction; Trip Generation; Impacts; Proposed Mitigation; Summary and Conclusions	This is noted. Full details provided within the TA (presented within Appendix 9A in PEI Report Volume III).
		Junction capacity analysis is also required at Kiln Lane/ North Moss Lane/ Trondheim Way roundabout and A180/ Moody Lane/ Pyewipe Road roundabout.	Counts were commissioned at these junctions. Analysis is provided within the TA (Appendix 9A in PEI Report Volume III).
		A Travel Plan will be required to be submitted as part of the planning application.	A Framework Operational Travel Plan has been prepared and included (see Annex 6 of the TA in Appendix 9A, PEI Report Volume III).
		Due to the number of construction workers required at the site, we would also request a Construction Travel Plan to deal with how staff are going to travel to site during the construction phases	A Framework Construction Travel Plan has been prepared and included (see Annex 26 of the TA in Appendix 9A, PEI Report Volume III).
		A Construction Management Plan will be required to detail how traffic will be managed during the construction phase. A draft should be submitted as part of the	A Framework Construction Traffic Management Plan has been prepared and included (see Annex 27 of the TA in Appendix 9A, PEI Report Volume III).

CONSUL-TEE	DATE (METHOD OF CONSUL-TATION)	SUMMARY OF CONSULTEE COMMENTS	SUMMARY OF RESPONSE/ HOW COMMENTS HAVE BEEN ADDRESSED
		planning application submission.	
		A Delivery and Servicing Plan will be required to demonstrate how deliveries and servicing will be managed. This should include (but not be limited to) details of banksmen requirements, scheduling to ensure that vehicles are not left waiting on the highway, time restrictions etc. A Draft should be submitted as part of the planning application submission.	A Delivery and Servicing Plan has been prepared and included (see Annex 25 of the TA in Appendix 9A, PEI Report Volume III).
North East Lincolnshire Council	February 2019 (response to submitted TA for Consented Development)	Highways Officers note that the SHIIP site access (a new roundabout on the A1173) has not been included within the junction modelling.	This is noted. Full details provided within the TA (Appendix 9A in PEI Report Volume III).
		Highways Officers query why the Pyewipe Roundabout (A180/ Estate Rd No 1/ Gilbey Rd/ Estate Rd No 2) has not been modelled.	The Transport Assessment considered the Westgate Roundabout which is in close proximity to the Pyewipe Roundabout. Analysis showed that development traffic as a percentage of total traffic at the Westgate Roundabout is likely to be in the order of 1.5% - 1.6% in the AM Peak hour and 0.5% - 0.6% during the PM Peak hour in future years. The percentage impact at the Pyewipe Roundabout would therefore be similar and not material.
Planning Inspectorate	(EIA Scoping Opinion for Proposed Development)	The ES should provide a clear justification as to why the study area chosen is sufficient to address the extent of the likely impacts resulting from the Proposed Development.	Evidence is provided within Section 9.3 of this Chapter which outlines which road links trigger the rule threshold guidelines.

CONSUL- TEE	DATE (METHOD OF CONSUL- TATION)	SUMMARY OF CONSULTEE COMMENTS	SUMMARY OF RESPONSE/ HOW COMMENTS HAVE BEEN ADDRESSED
	October 2019	The ES must consider the individual impacts considered (such as severance or driver delay) in addition to changes in traffic flow.	Assessment of individual impacts (including severance, driver delay and changes in traffic flow) is provided in Section 9.6 of this Chapter.
		The ES should explain how many vehicle movements are expected to be generated during operation both from staff travelling to and from the development site and from likely maintenance operations and assess impacts where a likely significant effect may occur.	Full details of vehicle movements are provided within the TA (Appendix 9A in PEI Report Volume III) and summarised in this Chapter.
		The Scoping Report states that no additional baseline surveys are expected to be required but does not explain how the baseline would be updated. The ES should explain how any updates to the baseline have been derived.	Base traffic flows have been updated using the traffic count data collected in 2018. Full details are provided within the TA (Appendix 9A in PEI Report Volume III).
		The updated TA should include an assessment of the impact on the operational railway and level crossing on South Marsh Road, as advised by Network Rail.	An assessment of impacts on the railway and level crossing on South Marsh Road will be provided in the final TA, and the Applicant will consult with Network Rail prior to submission of the DCO application.

9.4 Baseline Conditions

Site Location

- 9.4.1 The Proposed Development is located approximately 3 km north-east of the A180 Stallingborough Interchange which connects to the A1173.
- 9.4.2 The A1173 runs north-south linking to the A180 Stallingborough Interchange to the south at a grade separated roundabout and the A1173/ Kiln Lane roundabout to the north. As described in Table 9.1, this section of the A1173 is a 7.3 m wide single carriageway road and is subject to the national speed limit.

- 9.4.3 At the A1173/ Kiln Lane roundabout, the A1173 heads north towards Immingham and Kiln Lane continues east. As described in Table 9.1, Kiln Lane is a 7.3 m wide single carriageway road which is street lit and is subject to a 40 mph speed limit and provides access to a number of industrial units.
- 9.4.4 Continuing approximately 1.8 km east along Kiln Lane, the road connects with Hobson Way and Laporte Road at a four arm standard roundabout. Continuing south along Hobson Way, the single carriageway road is subject to a 40 mph speed limit. The road is street lit and a pedestrian footway is provided along the western side of the carriageway.
- 9.4.5 Continuing south along Hobson Way, the road connects with South Marsh Road approximately 1.2 km south of Kiln Lane at a three arm priority T-junction. Access to the Proposed Development is proposed from South Marsh Road which also provides highway access to the existing South Humber Bank Power Station, Synthomer (UK) Limited, the NEWLINCS Integrated Waste Management Facility and Environment Agency access to sections of the Humber Estuary flood defence. South Marsh Road is a 6.75 m wide single carriageway road which is street lit and is subject to a 40 mph speed limit.

Existing Traffic Flows

- 9.4.6 As described in Section 9.3, the following highway links form the highway network of interest (the Study Area) for this assessment:
- South Marsh Road (East of Hobson Way);
 - South Marsh Road (West of Hobson Way);
 - Hobson Way (North of South Marsh Road);
 - Kiln Lane (West of Hobson Way);
 - A1173 (West of North Moss Lane); and
 - A1173 (North of A180).
- 9.4.7 Baseline 24 hour annual average daily traffic (AADT) two-way link flows for the Study Area are provided in Table 9.4. Further details of the baseline traffic data are provided in the TA at Appendix 9A in PEI Report Volume III.

Table 9.4: 2018 baseline traffic flows

LINK NO.	LOCATION	TOTAL VEHICLES	TOTAL HGVS
1	South Marsh Road (East of Hobson Way)	790	208
2	South Marsh Road (West of Hobson Way)	781	56
3	Hobson Way (North of South Marsh Road)	1,220	256
4	Kiln Lane (West of Hobson Way)	2,854	1,005
5	A1173 (West of North Moss Lane)	8,997	2,537
6	A1173 (North of A180)	14,197	2,644

Baseline Accident Record

- 9.4.8 Personal Injury Accident (PIA) data has been obtained from the Crashmap website for the period 1st January 2014 to 31st December 2018 for the Study Area, which includes A180/ A1173 interchange, A1173, Kiln Lane, Hobson Way and South Marsh Road and the A180 Westgate Roundabout.
- 9.4.9 In total, 12 accidents were recorded between the A180/ A1173 Interchange and South Marsh Road of which eight were recorded as 'Slight' and four as 'Serious'. Table 9.5 summarises the accidents that have occurred over the specific period.

Table 9.5: Summary of recorded accidents 1st January 2014 to 31st December 2018

LOCATION	ACCIDENT SEVERITY			
	Slight	Serious	Fatal	Total
A180/ A1173 Stallingborough Interchange	4	1	0	5
A1173 Corridor	0	1	0	1
A1173/ Kiln Lane Roundabout	1	0	0	1
Kiln Lane Corridor	2	1	0	3
Kiln Lane/ Hobson Way/ Laporte Road Roundabout	1	0	0	1
Hobson Way Corridor	0	1	0	1
South Marsh Road	0	0	0	0

- 9.4.10 In total, 28 accidents were recorded at the A180 Westgate Roundabout of which 27 were recorded as 'Slight' and one as 'Serious'.
- 9.4.11 As can be seen in Table 9.5, the local highway network in the vicinity of the Site has a low accident record.
- 9.4.12 In summary the cause of the majority of accidents within the Study Area was driver error due to lack of awareness or loss of control as opposed to any physical alignments on the highway infrastructure.

Future Baseline

- 9.4.13 As described at paragraphs 9.3.12 to 9.3.13 above, two potential construction programme scenarios have been assessed – construction starting in Q1 2020 and construction starting in Q3 2026. Future year baseline traffic flows for the assessment years of 2021 and 2027 (the peaks of construction relevant to the two construction programme assessment scenarios) and 2023 and 2029 (the two potential Opening years) have been derived by applying the standard Trip End Model Presentation Program (TEMPO) to the above flows and are indicated in Table 9.6. These growth factors have been applied to the baseline to derive the future baseline flows presented in Table 9.7.

Table 9.6: TEMPRO traffic growth factors (average day)

YEAR	ROAD TYPE	GROWTH FACTOR
2018 – 2021 (Peak of Construction)	Principal	1.0405
2018 – 2023 (Opening Year)	Principal	1.0680
2018 – 2027 (Peak of Construction)	Principal	1.1115
2018 – 2029 (Opening Year)	Principal	1.1273

Table 9.7: Future baseline traffic flows (24 Hour AADT) relevant to construction starting Q1 2020

LINK NO.	LOCATION	2021 BASELINE		2023 BASELINE	
		TOTAL VEHICLE	TOTAL HGVS	TOTAL VEHICLE	TOTAL HGVS
1	South Marsh Road (East of Hobson Way)	822	216	844	222
2	South Marsh Road (West of Hobson Way)	813	58	834	60
3	Hobson Way (North of South Marsh Road)	1,269	266	1,303	273
4	Kiln Lane (West of Hobson Way)	2,970	1,046	3,048	1,073
5	A1173 (West of North Moss Lane)	9,361	2,640	9,609	2,710
6	A1173 (North of A180)	14,772	2,751	15,162	2,824

Table 9.8: Future baseline traffic flows (24 Hour AADT) relevant to construction starting Q3 2026

LINK NO.	LOCATION	2027 BASELINE		2029 BASELINE	
		TOTAL VEHICLE	TOTAL HGVS	TOTAL VEHICLE	TOTAL HGVS
1	South Marsh Road (East of Hobson Way)	878	231	891	234
2	South Marsh Road (West of Hobson Way)	868	64	880	63
3	Hobson Way (North of South Marsh Road)	1,356	285	1,375	289
4	Kiln Lane (West of Hobson Way)	3,172	1,117	3,217	1,133
5	A1173 (West of North Moss Lane)	10,000	2,820	10,142	2,860
6	A1173 (North of A180)	15,780	2,939	16,004	2,981

- 9.4.14 The assessment also has regard to the traffic generated by the following committed developments within the Study Area:
- North Beck Energy Centre (Planning Ref: DM/0026/18/FUL) ;
 - Stallingborough Employment Site (Planning Ref: DM/0105/18/FUL);
 - End of Life Tyre Pyrolysis Plant (Planning Ref: DM/0333/17/FUL);
 - Paragon/ Kia Development (Planning Ref: DM/0147/16/FUL);
 - Renewable Power Facility (Planning Ref: DM/0848/14/FUL); and
 - Development of a Sustainable Transport Fuels Facility (Planning Ref: DM/0664/19/FUL).
- 9.4.15 The list of committed developments will remain under review until the TA and ES modelling has to be finalised.
- 9.4.16 Traffic from the Consented Development has not been included to enable an assessment of the effects of the Proposed Development (in Section 9.6) against a future baseline without the Consented Development.
- 9.4.17 The total committed two-way flows for each link road within the Study Area for the Construction (peak) years 2021 and 2027, and the Opening years 2023 and 2029 are shown in Tables 9.9 and 9.10.

Table 9.9: Committed development flows (24 hour AADT) relevant to construction starting Q1 2020

LINK NO.	LOCATION	2021		2023	
		TOTAL VEHICLE	TOTAL HGVS	TOTAL VEHICLE	TOTAL HGVS
1	South Marsh Road (East of Hobson Way)	0	0	0	0
2	South Marsh Road (West of Hobson Way)	0	0	0	0
3	Hobson Way (North of South Marsh Road)	576	276	650	276
4	Kiln Lane (West of Hobson Way)	1,313	356	1,559	528
5	A1173 (West of North Moss Lane)	1,043	159	1,380	682
6	A1173 (North of A180)	2,206	542	2,989	983

Table 9.10: Committed development flows (24 hour AADT) relevant to construction starting Q3 2026

LINK NO.	LOCATION	2027		2029	
		TOTAL VEHICLE	TOTAL HGVS	TOTAL VEHICLE	TOTAL HGVS
1	South Marsh Road (East of Hobson Way)	0	0	0	0
2	South Marsh Road (West of Hobson Way)	0	0	0	0
3	Hobson Way (North of South Marsh Road)	350	276	350	276
4	Kiln Lane (West of Hobson Way)	1,259	528	1,259	528
5	A1173 (West of North Moss Lane)	1,190	758	1,190	758
6	A1173 (North of A180)	3,824	1,388	3,824	1,388

9.4.18 Tables 9.11 and 9.12 summarise the future year baseline (i.e. existing baseline traffic, plus growth factor, plus committed development traffic flows) for the assessment years 2021 and 2027 (Construction peak) and 2023 and 2029 (Opening).

Table 9.11: Future baseline traffic flows including committed development (24 hour AADT) relevant to construction starting in Q1 2020

LINK NO.	LOCATION	2021 BASELINE PLUS COMMITTED		2023 BASELINE PLUS COMMITTED	
		TOTAL VEHICLE	TOTAL HGVS	TOTAL VEHICLE	TOTAL HGVS
1	South Marsh Road (East of Hobson Way)	822	216	844	222
2	South Marsh Road (West of Hobson Way)	813	58	834	60
3	Hobson Way (North of South Marsh Road)	1,845	542	1,953	549
4	Kiln Lane (West of Hobson Way)	4,283	1,402	4,607	1,601
5	A1173 (West of North Moss Lane)	10,404	2,799	10,989	3,392
6	A1173 (North of A180)	16,978	3,293	18,151	3,807

Table 9.12: Future baseline traffic flows including committed development (24 hour AADT) relevant to construction starting in Q3 2026

LINK NO.	LOCATION	2027 BASELINE PLUS COMMITTED		2029 BASELINE PLUS COMMITTED	
		TOTAL VEHICLE	TOTAL HGVS	TOTAL VEHICLE	TOTAL HGVS
1	South Marsh Road (East of Hobson Way)	878	231	891	324
2	South Marsh Road (West of Hobson Way)	868	64	880	63
3	Hobson Way (North of South Marsh Road)	1,706	561	1,725	565
4	Kiln Lane (West of Hobson Way)	4,431	1,645	4,476	1,661
5	A1173 (West of North Moss Lane)	11,190	3,578	11,332	3,618
6	A1173 (North of A180)	19,604	4,327	19,828	4,369

9.5 Development Design and Impact Avoidance

9.5.1 It is recognised that the Proposed Development represents a major construction project in the area and that it is essential to minimise the temporary impact of construction traffic over the approximate 36 month construction period. During the construction phase, the Applicant will apply the following mitigation measures in respect of the local highways:

- implementation of a Construction Worker Travel Plan (CWTP) aimed at identifying measures and establishing procedures to encourage workers to ensure that vehicle occupancy rates used in the Transport Assessment as a basis for analysis are achieved (a Framework CWTP is provided in Annex 26 of the TA in Appendix 9A PEI Report Volume III). Measures could include:
 - managing the number and use of parking spaces on-site to ensure that the number of vehicles arriving at the Site is controlled;
 - encouraging contractors to provide minibuses for transporting their workers from key points of construction worker origin to the Site;
 - implementing a construction worker car share scheme; and
 - providing secure parking for bicycles.
- implementation of a Construction Traffic Management Plan (CTMP) identifying measures to control the routing and impact that construction HGVs will have on the local road network during construction (a Framework CTMP is provided in Annex 27 of the TA in Appendix 9A PEI Report Volume III). Measures could include:
 - HGV routing plan communicated to all drivers during their induction;
 - local signage strategy;
 - limiting construction delivery hours to 07:00 – 19:00;
 - management of abnormal load deliveries; and
 - 24 hour contact name and number for members of the public should there be any issues relating to construction traffic.

- 9.5.2 During operation, an Operational Travel Plan will be implemented, aimed at identifying measures and establishing procedures to encourage operational staff to adopt modes of transport which reduce reliance on single occupancy private car use. A Framework Operational Travel Plan is provided in Annex 6 of the TA in Appendix 9A, PEI Report Volume III.
- 9.5.3 A Delivery and Servicing Plan will also be prepared to demonstrate how deliveries and servicing will be managed, including a routing plan for operational HGVs. A draft is provided in Annex 25 of the TA in Appendix 9A, PEI Report Volume III.

9.6 Likely Impacts and Effects

The Proposed Development

- 9.6.1 The impacts and effects of the Proposed Development compared to a future baseline without the Consented Development are described below.

Construction

- 9.6.2 It is proposed that all construction worker vehicles and HGVs will access the Site from South Marsh Road via the existing gate entrance to the east of South Humber Bank Power Station (in the north-west of the Main Development Area) and via a newly constructed access for the Proposed Development in the north-east of the Main Development Area (see Annex 5 of the TA in Appendix 9A, PEI Report Volume III).
- 9.6.3 The construction period for the Proposed Development is temporary in nature and estimated to be approximately 36 months starting in 2020, reaching a peak in 2021. However, if for any reason construction is delayed as late as possible after DCO award, the worst case scenario for traffic would be construction starting in 2026, reaching a peak in 2027.
- 9.6.4 The profile of the anticipated daily workforce each month through the construction period is provided in the TA presented within Appendix 9A in PEI Report Volume III. The standard construction working hours for the Proposed Development will be 07:00 to 19:00 Monday to Saturday. Key exceptions to these working hours could include activities that be carried out continuously (such as concrete slip-forming) and internal non-noisy activities, where they comply with any restrictions agreed with NELC.
- 9.6.5 Based on the methodology contained within the TA (Appendix 9A in PEI Report Volume III), the weekday construction worker shift is likely to generate 375 vehicular trips (one-way) during the AM arrival and PM departure periods at the peak of construction (estimated to be at the beginning of the second year of construction, around Q1 2021 or Q3 2027).
- 9.6.6 The volume of construction HGVs on the network is predicted to be at its maximum of 412 two-way daily vehicle movements (206 in and 206 out) during part of the first year of construction (around Q1 2020), associated with the potential cut and fill of the top layer of ground within the Main Development Area to improve the geotechnical condition of the ground. During the remainder of the construction period HGV movements will vary between 18 and 116 two-way movements per day.
- 9.6.7 Combining construction workforce vehicle movements with construction HGV movements over the entire construction programme shows the overall peak of construction to occur in the second year of construction (around Q1 2021 or Q3 2027) when 866 two-way vehicle movements are anticipated (750 two-way car/ van movements and 116 two-way HGV movements per day). Construction deliveries will be made between 07:00 and 19:00 hours.

- 9.6.8 A number of Abnormal Indivisible Load (AIL) movements are expected during the construction programme associated with the delivery of large items of plant and equipment.
- 9.6.9 The ports of Immingham, Hull and Goole are situated near to the Proposed Development. Detailed consideration will be given to the appropriate port and AIL routes during detailed design when details of the size of loads and timing of deliveries are known. However, it is a reasonable expectation that major ports are able to accommodate abnormal loads and that adequate access to the strategic network is achievable. NELC (and others as appropriate) will be consulted regarding the route, dates and any traffic management requirements for AIL deliveries.
- 9.6.10 Table 9.13 below summarises the expected daily profile of construction phase peak traffic levels.

Table 9.13: Daily construction vehicle profile (Construction peak)

HOUR BEGINNING	CONSTRUCTION WORKER VEHICLES		CONSTRUCTION HGVS	
	ARRIVALS	DEPARTURES	ARRIVALS	DEPARTURES
06:00	158	0	0	0
07:00	138	0	5	5
08:00	45	0	5	5
09:00	34	0	5	5
10:00	0	0	5	5
11:00	0	0	5	5
12:00	0	0	5	5
13:00	0	0	5	5
14:00	0	0	5	5
15:00	0	0	5	5
16:00	0	82	5	5
17:00	0	98	5	5
18:00	0	176	3	3
19:00	0	19	0	0
Total	375	375	58	58

- 9.6.11 Based on the vehicle assignment contained within the TA in Appendix 9A, PEI Report Volume III, Table 9.14 summarises the likely changes in link flows within the Study Area for the Construction assessment year 2021, and Table 9.15 summarises the likely changes for the Construction assessment year 2027. HGV traffic has been assigned to the most direct route to the strategic network which is the A180 Stallingborough Interchange via Hobson Way, Kiln Lane and the A1173. The construction workers assignment has been based on the geographic split of population within a 45 minute drive-time of the Site.

Table 9.14: 2021 base + committed development + construction traffic

LINK	LOCATION	BASELINE FLOW (INC. COM DEV)		CONSTRUCTION TRAFFIC		PERCENTAGE INCREASE	
		TOTAL VEH.	TOTAL HGVS	TOTAL VEH.	TOTAL HGVS	TOTAL VEH.	TOTAL HGVS
1	South Marsh Road (East of Hobson Way)	822	216	866	116	105.4%	53.7%
2	South Marsh Road (West of Hobson Way)	813	58	75	0	9.2%	0.0%
3	Hobson Way (North of South Marsh Road)	1,845	542	791	116	42.9%	21.4%
4	Kiln Lane (West of Hobson Way)	4,283	1,402	791	116	18.5%	8.3%
5	A1173 (West of North Moss Lane)	10,404	2,799	791	116	7.6%	4.1%
6	A1173 (North of A180)	16,978	3,293	784	116	4.6%	3.5%

Table 9.15: 2027 base + committed development + construction traffic

LINK	LOCATION	BASELINE FLOW (INC. COM DEV)		CONSTRUCTION TRAFFIC		PERCENTAGE INCREASE	
		TOTAL VEH.	TOTAL HGVS	TOTAL VEH.	TOTAL HGVS	TOTAL VEH.	TOTAL HGVS
1	South Marsh Road (East of Hobson Way)	878	231	866	116	98.6%	50.2%
2	South Marsh Road (West of Hobson Way)	868	64	75	0	8.6%	0.0%
3	Hobson Way (North of South Marsh Road)	1,706	561	791	116	46.4%	20.7%
4	Kiln Lane (West of Hobson Way)	4,431	1,645	791	116	17.9%	7.1%
5	A1173 (West of North Moss Lane)	11,190	3,578	791	116	7.1%	3.2%
6	A1173 (North of A180)	19,604	4,327	784	116	4.0%	2.7%

9.6.12 As described in Section 9.3 above, the IEA guidelines (IEA, 1993) suggests two broad rules of thumb should be used as a screening process to delimit the scale and extent of assessment:

- Rule 1: Include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%); and
- Rule 2: Include any other specifically sensitive areas where traffic flows have increased by 10% or more.

9.6.13 Table 9.14 demonstrates that the Proposed Development construction traffic will result in a greater than 30% increase in traffic on South Marsh Road (East of Hobson Way) (105.4% increase) and Hobson Way (North of South Marsh Road) (42.9% increase), if the peak of construction traffic is in 2021. This is primarily due to the low number of existing vehicles using South Marsh Road and Hobson Way.

9.6.14 Table 9.15 demonstrates that the Proposed Development construction traffic will result in a greater than 30% increase in traffic on South Marsh Road (East of Hobson Way) (98.6% increase) and Hobson Way (North of South Marsh Road) (46.4% increase), if the peak of construction traffic is in 2027. This is primarily due to the low number of existing vehicles using South Marsh Road and Hobson Way.

9.6.15 For all other links within the Study Area no further assessment has been undertaken based on the IEA screening rules above. As such, the environmental effects associated with construction traffic would be negligible adverse (not significant) on all links except for South Marsh Road (East of Hobson Way) and Hobson Way (North of South Marsh Road). Effects on these two links are assessed below.

Severance

9.6.16 It is evident that the change in total traffic associated with construction is greater than 90% (high impact) on South Marsh Road (East of Hobson Way) due to low current usage of that road, however given the link sensitivity is low, the overall effect is considered minor adverse (not significant).

9.6.17 The change in total traffic associated with construction is between 30% and 60% (low impact) on Hobson Way (North of South Marsh Road) due to the low current usage of that road, however given the link sensitivity is low, the overall effect is considered negligible adverse (not significant).

Pedestrian Amenity

9.6.18 It is identified in the IEA guidelines (IEA, 1993), that pedestrian amenity is affected where traffic flows are halved or doubled. It is evident that the change in total traffic (or HGV component) associated with construction is greater than 100% (medium impact) on South Marsh Road (East of Hobson Way) however given the link sensitivity is low with no pedestrian footways provided on this section of South Marsh Road, the overall effect is considered minor adverse (not significant).

9.6.19 The change in total traffic (or HGV component) associated with construction is 42.9% (very low impact) on Hobson Way. The link sensitivity is considered low given a pedestrian footway is provided on the western side of the carriageway. The overall effect is therefore considered negligible adverse (not significant).

Fear and Intimidation

9.6.20 It is evident that the change in total traffic associated with construction is greater than 90% (high impact) on South Marsh Road (East of Hobson Way) due to low current usage of that road, however given the link sensitivity is low, the overall effect is considered minor adverse (not significant).

- 9.6.21 The change in total traffic associated with construction is between 30% and 60% (low impact) on Hobson Way (North of South Marsh Road) due to the low current usage of that road, however given the link sensitivity is low, the overall effect is considered negligible adverse (not significant).

Accidents and Safety

- 9.6.22 There have been zero PIAs on South Marsh Road (East of Hobson Way) in the last five years. As such increases in traffic associated with construction will result in a negligible adverse (not significant) effect.
- 9.6.23 There has only been a single PIA on Hobson Way (North of South Marsh Road) in the last five years. Considering the traffic flows over this period (1,220 AADT) and the length of the link (1.2 km) the calculated accident rate is 374 accidents per billion vehicle kilometres. Compared with the national average rate which in 2016 was 480 accidents per billion vehicle kilometres it is considered that Hobson Way has low sensitivity, which with low magnitude increases in traffic will result in a negligible adverse (not significant) effect.

Driver Delay

- 9.6.24 The performance of a junction is judged by the ratio of flow to capacity (RFC). As a general guide, a junction operating below a threshold of 0.85 is considered to operate within its design capacity. Junction modelling has been undertaken at key junctions within the Study Area (the results of which are provided in the TA in Appendix 9A, PEI Report Volume III) for the AM and PM Peak hours (07:00 – 08:00 and 16:00 – 17:00) and demonstrates that each junction operates within its design capacity in terms of the future baseline and future baseline plus Proposed Development peak of construction scenarios apart from the A180 Westgate Roundabout. The A180 Westgate Roundabout junction is already operating above its theoretical capacity in 2018. However, considering the small percentage that construction flows are adding to the junction, it is reasonable to consider that mitigation at this junction would be disproportionate to the marginal impact on the junction's performance. Junction modelling therefore leads to the conclusion that the driver delay effect of the Proposed Development during construction will be negligible adverse (not significant).

Opening and Operation

- 9.6.25 Once operational the Proposed Development will employ up to 56 staff. Conservatively assuming a car occupancy of one staff member per vehicle, this equates to 56 cars per day (112 vehicle movements).
- 9.6.26 Given the 24 hour operation of the facility a staff shift system will be in operation and is likely to be undertaken via three 8 hour shifts (06:00 – 14:00, 14:00 – 22:00, 22:00 – 06:00). It is anticipated there will be a maximum of 14 staff per shift, with an additional 14 day/ management staff being employed at the Proposed Development.
- 9.6.27 As set out in the TA (Appendix 9A in PEI Report Volume III), the forecast operational HGV traffic is based on worst case assumptions for the purposes of assessment:
- average fuel net calorific value (NCV) at the lowest end of the operational range (9 MJ/kg) for the expected plant annual running hours, resulting in a maximum annual fuel throughput of 753,500 tonnes; and
 - average HGV payload of 16 tonnes.
- 9.6.28 Deliveries of consumables, and removal of bottom ash and flue gas treatment residues off-site are proposed to occur between the hours of 06:00 and 18:00. Fuel deliveries are proposed to take place 24 hours per day, seven days per week – this is a change from

the fuel delivery hours that were assumed for the Consented Development of 06:00 to 18:00 following discussions between the Applicant and potential fuel suppliers. However, for the purposes of the transport assessment, as a worst case it is assumed that all deliveries (consumables and fuel) and collections (bottom ash and flue gas treatment residues) will take place between 06:00 and 18:00.

- 9.6.29 Based on these assumptions it is anticipated that total HGV movements at the Proposed Development would be 312 in and 312 out per day. The calculation of anticipated fuel deliveries is set out in the TA (Appendix 9A in PEI Report Volume III).
- 9.6.30 It is expected that each year the facility will be taken offline for approximately three weeks to allow for invasive maintenance activities such as internal inspection of the boiler. Approximately every five to six years the facility will be taken offline for a major outage for substantial maintenance activities such as replacement of sections of the boiler. Such a major outage is likely to last approximately five weeks where it could be expected that up to 200 staff could be on site on any one day.
- 9.6.31 Table 9.16 below summarises the expected daily profile of operational traffic levels.

Table 9.16: Daily operational vehicle profile

HOUR BEGINNING	STAFF VEHICLES		OPERATIONAL HGVS	
	ARRIVALS	DEPARTURES	ARRIVALS	DEPARTURES
05:00	14	0	0	0
06:00	0	14	44	43
07:00	14	0	33	33
08:00	0	0	36	33
09:00	0	0	36	34
10:00	0	0	26	31
11:00	0	0	29	27
12:00	0	0	29	27
13:00	14	0	26	25
14:00	0	14	20	20
15:00	0	0	16	18
16:00	0	0	13	14
17:00	0	14	4	5
18:00	0	0	0	2
19:00	0	0	0	0
20:00	0	0	0	0
21:00	14	0	0	0
22:00	0	14	0	0
23:00	0	0	0	0
00:00	0	0	0	0
Total	56	56	312	312

9.6.32 Based on the staff and HGV vehicle assignments contained within the TA (Appendix 9A in PEI Report Volume III), Table 9.17 summarises the likely changes in link flows within the agreed Study Area for the 2023 Opening year, and Table 9.18 summarises the likely changes for the 2029 Opening year.

Table 9.17: 2023 base + committed development + operational traffic

LINK	LOCATION	BASELINE FLOW (INC. COM DEV)		OPERATIONAL TRAFFIC		PERCENTAGE INCREASE	
		TOTAL VEH.	TOTAL HGVS	TOTAL VEH.	TOTAL HGVS	TOTAL VEH.	TOTAL HGVS
1	South Marsh Road (East of Hobson Way)	844	222	736	624	87.2%	281.0%
2	South Marsh Road (West of Hobson Way)	834	60	52	0	6.2%	0.0%
3	Hobson Way (North of South Marsh Road)	1,953	549	685	624	35.1%	113.7%
4	Kiln Lane (West of Hobson Way)	4,607	1,601	685	624	14.9%	39.0%
5	A1173 (West of North Moss Lane)	10,989	3,392	685	624	6.2%	18.4%
6	A1173 (North of A180)	18,151	3,807	682	624	3.8%	16.4%

Table 9.18: 2029 base + committed development + operational traffic

LINK	LOCATION	BASELINE FLOW (INC. COM DEV)		OPERATIONAL TRAFFIC		PERCENTAGE INCREASE	
		TOTAL VEH.	TOTAL HGVs	TOTAL VEH.	TOTAL HGVs	TOTAL VEH.	TOTAL HGVs
1	South Marsh Road (East of Hobson Way)	891	234	736	624	82.6%	266.7%
2	South Marsh Road (West of Hobson Way)	880	63	52	0	5.9%	0.0%
3	Hobson Way (North of South Marsh Road)	1,725	565	685	624	39.7%	110.4%
4	Kiln Lane (West of Hobson Way)	4,476	1,661	685	624	15.3%	37.6%
5	A1173 (West of North Moss Lane)	11,332	3,618	685	624	6.0%	17.2%
6	A1173 (North of A180)	19,828	4,369	685	624	3.5%	14.3%

9.6.33 The operational traffic assessment Study Area is based on Rules 1 and 2 of the IEA guidelines (IEA, 1993) as described in Section 9.3 above.

9.6.34 Table 9.17 (Operation in 2023) demonstrates that the operational traffic associated with the Proposed Development will result in a greater than 30% increase in traffic on South Marsh Road (East of Hobson Way) in 2023 with an 87.2% increase in total traffic and a 281.0% increase in HGVs. Hobson Way (North of South Marsh Road) shows an increase in total traffic of 35.1% and an increase in HGV traffic of 113.7% in 2023. This is primarily due to the low number of existing vehicles using South Marsh Road and Hobson Way. In addition, Kiln Lane (West of Hobson Way) shows an increase in total traffic of 14.9% and an increase in HGV traffic of 39.0% in 2023.

9.6.35 Table 9.18 (Operation in 2029) demonstrates that the operational traffic associated with the Proposed Development will result in a greater than 30% increase in traffic on South Marsh Road (East of Hobson Way) in 2029 with an 82.6% increase in total traffic and a 266.7% increase in HGVs. Hobson Way (North of South Marsh Road) shows an increase in total traffic of 39.7% and an increase in HGV traffic of 110.4% in 2029. This is primarily due to the low number of existing vehicles using South Marsh Road. and Hobson Way. In addition, Kiln Lane (West of Hobson Way) shows an increase in total traffic of 15.3% and an increase in HGV traffic of 37.6% in 2029.

9.6.36 For all other links within the Study Area no further assessment has been undertaken based on IEA screening rules. As such, the environmental effects associated with operational traffic would be negligible adverse (not significant) on all links except for South Marsh Road (East of Hobson Way), Hobson Way (North of South Marsh Road) and Kiln Lane in 2023 or 2029. Effects on these three links are assessed below.

Severance

9.6.37 It is evident from Table 9.17 that the change in total traffic associated with operation of the Proposed Development in 2023 is between 60% and 90% (medium impact) on South

Marsh Road (East of Hobson Way) due to low current usage of that road, however given the link sensitivity is low with no pedestrian footways on this section of road, the overall effect is considered minor adverse (not significant).

- 9.6.38 The change in total traffic associated with operation of the Proposed Development in 2023 is between 30% and 60% (low impact) on Hobson Way (North of South Marsh Road) due to the low current usage of that road. The link sensitivity is considered low given a pedestrian footway is provided on the western side of the carriageway. The overall effect is therefore considered negligible adverse (not significant).
- 9.6.39 The change in total traffic associated with operation of the Proposed Development in 2023 is less than 30% (very low impact) on Kiln Lane (West of Hobson Way). The link sensitivity is considered low given a pedestrian footway is provided on the southern side of the carriageway. The overall effect is therefore considered negligible adverse (not significant).
- 9.6.40 For operation in 2029, it is evident from Table 9.18 that the magnitude of impacts, link sensitivities and significance of effects on severance are the same as described above at paragraphs 9.6.37 to 9.6.39 for operation in 2023.
- 9.6.41 The overall effect on South Marsh Road (East of Hobson Way) in 2029 is assessed to be a medium impact resulting in a minor adverse (not significant) effect. The overall effect on Hobson Way (North of South Marsh Road) in 2029 is assessed to be a low impact resulting in a negligible adverse (not significant) effect, and the overall effect on Kiln Lane (West of Hobson Way) in 2029 is assessed to be very low impact resulting in a negligible adverse (not significant) effect.

Pedestrian Amenity

- 9.6.42 It is identified in the IEA guidelines (IEA, 1993) that pedestrian amenity is affected where traffic flows are halved or doubled. It is evident from Table 9.17 that the change in total traffic (or HGV component) associated with operation is greater than 151% (high impact) on South Marsh Road (East of Hobson Way) in 2023 however given the link sensitivity is low with no pedestrian footways provided on this section of South Marsh Road, the overall effect is considered minor adverse (not significant).
- 9.6.43 The change in total traffic (or HGV component) associated with operation of the Proposed Development in 2023 is between 101% and 150% (medium impact) on Hobson Way due to the low HGV usage of that road. The link sensitivity is considered low given a pedestrian footway is provided on the western side of the carriageway. However given the low current HGV usage of this road, the overall effect is considered minor adverse (not significant).
- 9.6.44 The change in total traffic (or HGV component) associated with the Proposed Development in 2023 is less than 50% (very low impact) on Kiln Lane. The link sensitivity is considered low given a pedestrian footway is provided on the southern side of the carriageway. The overall effect is therefore considered negligible adverse (not significant).
- 9.6.45 For operation in 2029, it is evident from Table 9.18 that the magnitude of impacts, link sensitivities and significance of effects on pedestrian amenity are the same as described above at paragraphs 9.6.41 to 9.6.43 for operation in 2023.
- 9.6.46 The overall effect on South Marsh Road (East of Hobson Way) in 2029 is assessed to be a high impact resulting in a minor adverse (not significant) effect. The overall effect on Hobson Way (North of South Marsh Road) in 2029 is assessed to be a medium impact resulting in a minor adverse (not significant) effect, and the overall effect on Kiln Lane

(West of Hobson Way) in 2029 is assessed to be low impact resulting in a negligible adverse (not significant) effect.

Fear and Intimidation

- 9.6.47 It is evident from Table 9.17 that the change in total traffic associated with operation of the Proposed Development in 2023 is between 60% and 90% (medium impact) on South Marsh Road (East of Hobson Way) due to low current usage of that road, however given the link sensitivity is low, the overall effect is considered minor adverse (not significant).
- 9.6.48 The change in total traffic associated with operation in 2023 is between 30% and 60% (low impact) on Hobson Way (North of South Marsh Road) due to the low current usage of that road. The link sensitivity is considered low given a pedestrian footway is provided on the western side of the carriageway. The overall effect is therefore considered negligible adverse (not significant).
- 9.6.49 The change in total traffic associated with operation of the Proposed Development in 2023 is less than 30% (very low impact) on Kiln Lane (West of Hobson Way). The link sensitivity is considered low given a pedestrian footway is provided on the southern side of the carriageway. The overall effect is therefore considered negligible adverse (not significant).
- 9.6.50 For operation in 2029 it is evident from Table 9.18 that the magnitude of impacts, link sensitivities and significance of effects on fear and intimidation are the same as described above at paragraphs 9.6.47 to 9.6.49 for operation in 2023.
- 9.6.51 The overall effect on South Marsh Road (East of Hobson Way) in 2029 is assessed to be a medium impact resulting in a minor adverse (not significant) effect. The overall effect on Hobson Way (North of South Marsh Road) in 2029 is assessed to be a low impact resulting in a negligible adverse (not significant) effect, and the overall effect on Kiln Lane (West of Hobson Way) in 2029 is assessed to be very low impact resulting in a negligible adverse (not significant) effect.

Accidents and Safety

- 9.6.52 There have been zero PIAs on South Marsh Road (East of Hobson Way) in the last five years. As such increases in traffic associated with operation will result in a negligible adverse (not significant) effect.
- 9.6.53 There has only been a single PIA on Hobson Way (North of South Marsh Road) in the last five years. Considering the traffic flows over this period (1,220 AADT) and the length of the link (1.2 km) the calculated accident rate is 374 accidents per billion vehicle kilometres. Compared with the national average rate which in 2016 was 480 accidents per billion vehicle kilometres it is considered that Hobson Way has low sensitivity, which with low magnitude increases in traffic will result in a negligible adverse (not significant) effect.
- 9.6.54 There have been three PIAs on Kiln Lane (West of Hobson Way) in the last five years. Considering the traffic flows over this period (2,854 AADT) and the length of the link (1.8 km) the calculated accident rate is 319 accidents per billion vehicle kilometres. Compared to the national average rate which in 2016 was 480 accidents per billion vehicle kilometres it is considered that Kiln Lane has low sensitivity, which with low magnitude increase in traffic will result in a negligible adverse (not significant) effect.

Driver Delay

- 9.6.55 Junction modelling has been undertaken at key junctions within the Study Area (the results of which are provided in the TA in Appendix 9A, PEI Report Volume III) for the AM and PM Peak hours (07:00 – 08:00 and 16:00 – 17:00). This demonstrates that each

junction operates within its design capacity in terms of the future baseline and future baseline plus Proposed Development scenarios apart from the A180 Westgate Roundabout. The A180 Westgate Roundabout junction was already operating above its theoretical capacity in 2018. However, considering the small percentage that Proposed Development flows will add to the junction, it is reasonable to consider that mitigation at this junction would be disproportionate to the marginal impact on the junction's performance. Junction modelling therefore leads to the conclusion that the driver delay effect of the Proposed Development will be negligible adverse (not significant).

Decommissioning

- 9.6.56 The activities involved in the decommissioning process for the Proposed Development are not yet known in detail, as it has a design life of approximately 30 years. There would be expected to be some traffic movements associated with the removal (and recycling, as appropriate) of material arising from demolition and potentially the import of materials for land restoration and re-instatement. However, vehicle numbers are expected to be much lower than those experienced during the construction or operation.
- 9.6.57 Current baseline data collected for the purposes of this assessment will not be valid at the year of decommissioning. However, as it is unlikely that baseline traffic figures on local roads will reduce appreciably over the next thirty years, it is considered that the percentage increase in traffic due to decommissioning would be negligible adverse (not significant).

Comparison of Proposed Development and Consented Development

- 9.6.58 The impacts and effects of the Proposed Development compared to a future baseline with the Consented Development are described below.

Construction

- 9.6.59 As described in the TA (Appendix 9A PEI Report Volume III), the forecast construction traffic associated with the Proposed Development is the same as the forecast construction traffic associated with the Consented Development. This is because the conservative assumptions made for the TA for the Consented Development are also considered to be appropriate for the Proposed Development given the nature and overall scale of construction activity required for the Proposed Development, and given the limited additional works required to enable the generating station to generate up to 95MW.
- 9.6.60 In addition the same methods for managing construction traffic (as set out in Section 9.5 above) will be applied for both Consented Development and the Proposed Development.
- 9.6.61 The construction traffic assessment for the Proposed Development considers two potential construction programme scenarios (starting in Q1 2020 or starting in Q3 2026), whereas the assessment of the Consented Development considered construction starting in Q3 2019. The baseline traffic flows assumed for the Proposed Development and Consented Development construction traffic assessments are therefore slightly different, but the overall conclusions are the same – namely that there will be no significant effects on severance, pedestrian amenity, fear and intimidation, accidents and safety, and driver delay. As such, the construction of the Proposed Development is predicted to have no additional effects compared to a future baseline with the construction of the Consented Development.

Opening and Operation

- 9.6.62 The maximum annual fuel throughout (up to 753,500 tonnes per annum), the amounts of other consumables and by-products, the operational and delivery hours assumed for the

purposes of the transport assessment, and the number of staff, will be the same for the Proposed Development as for the Consented Development.

9.6.63 The frequency and scale of maintenance outages is also expected to be the same for the Proposed Development as for the Consented Development.

9.6.64 The operational traffic assessment for the Proposed Development considers two potential Opening years (2023 and 2029), whereas the assessment of the Consented Development assumed an Opening year of 2022. The baseline traffic flows assumed for the Proposed Development and Consented Development operational traffic assessments are therefore slightly different, but the overall conclusions are the same – namely that there will be no significant effects on severance, pedestrian amenity, fear and intimidation, accidents and safety, and driver delay. As such, the operation of the Proposed Development is predicted to have no additional effects compared to a future baseline with the operation of the Consented Development.

Decommissioning

9.6.65 The nature and scale of decommissioning activities required for the Proposed Development would be the same for the Proposed Development as for the Consented Development, so the decommissioning of the Proposed Development is predicted to have no additional effects compared to a future baseline with the decommissioning of the Consented Development.

9.7 Mitigation and Enhancement Measures

9.7.1 No additional mitigation measures or enhancement measures other than those set out in Section 9.5 are considered necessary.

9.8 Limitations or Difficulties

9.8.1 The assessment undertaken in this chapter is based on data and design information available at the time of assessment. No limitations or difficulties have been identified.

9.9 Residual Effects and Conclusions

9.9.1 Residual effects are those predicted following consideration of any proposed mitigation measures. All effects for the construction, operational and decommissioning phases are predicted to be minor/ negligible adverse (not significant).

9.9.2 Traffic increases associated with the construction of the Proposed Development have been assessed to be minor/ negligible adverse (not significant). The additional traffic due to the Proposed Development construction activities will result in small, temporary, increases of traffic flows, including HGVs, on the roads leading to the Site. In line with the significance criteria presented earlier in this chapter and in the TA (Appendix 9A in PEI Report Volume III), the impacts of construction traffic on all road sections and junctions are considered to be minor/ negligible adverse and not considered to be significant.

9.9.3 In line with the significance criteria presented earlier in this chapter and in the TA presented within Appendix 9A in PEI Report Volume III the impacts of operational traffic on all road sections and junctions are considered to be minor/ negligible adverse and not considered to be significant.

9.9.4 The forecast traffic that will be generated by the construction and operation of the Proposed Development is the same as that forecast for the construction and operation of the Consented Development. As such the Proposed Development will have no traffic impact when compared to a future baseline with the Consented Development.

9.10 References

Crashmap website (www.crashmap.co.uk)

Department for Energy and Climate Change (2011) *National Policy Statement for Energy (EN-1)*

Ministry for Communities and Local Government (2019) *National Planning Policy Framework*

Department for Transport (2013) *Circular 02/2013 – The Strategic Road Network and the Delivery of Sustainable Development*

Highways England (2015) *The Strategic Road Network: Planning for the Future – A guide to working with Highways England on Planning Matters*

Institution of Environmental Assessment (1993) *Guidelines for the Environmental Assessment of Road Traffic*

North East Lincolnshire Council (2016) *North East Lincolnshire local Transport Plan 2016 – 2032*

North East Lincolnshire Council (2018) *Local Plan North East Lincolnshire 2013 to 2032*

Planning Practice Guidance (2014) *Travel Plans, Transport Assessment and Statements in decision-taking*

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10.0 ECOLOGY

10.1 Introduction

10.1.1 This chapter of the Preliminary Environmental Information (PEI) Report addresses the potential effects of the Proposed Development on ecology features.

10.1.2 The initial ecological impact assessment presented within this PEI Report considers:

- the present-day and future baseline conditions at the Site;
- the predicted temporary effects of construction of the Proposed Development on habitats and species, with respect to construction traffic, construction dust and the Proposed Development;
- the predicted permanent/ long-term effects of the operation and maintenance of the Proposed Development on habitats and species; and
- the potential effects of decommissioning of the Proposed Development on habitats and species.

10.1.3 This chapter is supported by the following technical appendices, provided in PEI Report Volume III:

- Appendix 10A – Planning Policy and Legislation;
- Appendix 10B – Ecological Impact Assessment Method;
- Appendix 10C – Preliminary Ecological Assessment (PEA);
- Appendix 10D – Aquatic Invertebrate Survey;
- Appendix 10E – Otter and Water Vole Survey;
- Appendix 10F – Reptile Survey; and
- Appendix 10G – Habitats Regulations Assessment Signposting Report.

10.2 Legislation and Planning Policy Context

10.2.1 This initial ecological impact assessment (EclA) has been undertaken within the context of relevant planning policies, guidance documents and legislative instruments. A summary of these are provided below, and further details are included in Appendix 10A in PEI Report Volume III.

Legislative Background

10.2.2 The following legislation is considered relevant to the Proposed Development:

- Wildlife and Countryside Act (WCA) 1981 (as amended);
- Countryside and Rights of Way (CROW) Act 2000 (as amended);
- Natural Environment and Rural Communities (NERC) Act 2006 (as amended);
- The Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations);
- Protection of Badgers Act 1992 (as amended);
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (WFD); and
- Animal Welfare Act 2006.

National Planning Policy

- 10.2.3 The overarching National Policy Statement (NPS) for Energy (EN-1) (Department for Energy and Climate Change (DECC), 2011) sets out national policy for energy infrastructure. Part 5.3 relates to biodiversity and states that where development is subject to Environmental Impact Assessment (EIA), the Environmental Statement (ES) should clearly set out the effects on internationally, nationally and locally designated nature conservation sites, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity. It also requires that the applicant shows how the project has taken advantage of opportunities to conserve and enhance biodiversity.
- 10.2.4 The UK Government has committed to halting the overall decline in biodiversity. Planning policy support for this is set out in the National Planning Policy Framework (NPPF) published by the Ministry for Housing, Communities and Local Government in February 2019. While the NPPF does not directly apply to nationally significant infrastructure projects (NSIPs), such as the Proposed Development, it may be a relevant factor in their determination. The forthcoming Environment Bill will mandate biodiversity net gain for development (housing and commercial) but NSIPs will remain out of the scope for mandatory net gain in this Bill.
- 10.2.5 The NPPF states the commitment of the UK Government to minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt the overall decline in biodiversity. It specifies the obligations that Local Authorities and the UK Government have regarding statutory designated sites and protected species under UK and international legislation, and how this is to be delivered in the planning system. Protected or notable habitats and species can be a material consideration in planning decisions and may therefore make some sites unsuitable for particular types of development, or if development is permitted, mitigation measures may be required to avoid or minimise impacts on certain habitats and species, or where an impact is unavoidable, compensation may be required.

Local Development Plan Policy

- 10.2.6 Local planning policy relevant to ecology and nature conservation is set out in the North East Lincolnshire Local Plan, which was adopted by North East Lincolnshire Council (NELC) in 2018 and sets out a long-term vision for managing growth and development in the area up to 2032.
- 10.2.7 Policy 41 (Biodiversity and Geodiversity) relates to the protection of statutory and non-statutory designated sites, biodiversity features and the borough's ecological network.
- 10.2.8 Policy 9 (Habitat Mitigation – South Humber Bank) sets out the approach to delivering mitigation within the Local Plan area for the loss of wintering bird habitat that is functionally linked to the Humber Estuary internationally designated site. Within the Mitigation Zone identified on the policies map, development proposals on greenfield land that adversely affect the Humber Estuary Special Protection area (SPA)/ Ramsar site due to the loss of functionally linked land will be required to make contributions towards the provision and management of the mitigation sites identified. This is secured on a proportional approach relating to the site area. The Proposed Development lies within the Mitigation Zone, and therefore this policy will apply to the delivery of mitigation for wintering birds. The habitat mitigation contribution for the Consented Development was secured by a Section 106 agreement, and these provisions will be varied so that one contribution is payable regardless of which consent(s) are implemented. The quantum of the contribution will not change between the Consented Development and the Proposed Development, since the area of land potentially used by wintering birds and which will be lost is the same in each case.

Other Guidance

- 10.2.9 In July 2012, the UK Post-2010 Biodiversity Framework was published by the Joint Nature Conservation Committee and the Department for the Environment, Food and Rural Affairs (Defra). This covers the period from 2011 to 2020 and forms the UK Government's response to the UN Convention on Biological Diversity held in Nagoya in 2010. Following publication of the Framework, most of the strategic biodiversity work previously enacted under the UK Biodiversity Action Plan was delegated to each of the four countries comprising the United Kingdom of Great Britain and Northern Ireland. The Framework shows how the work of the four UK countries joins up to achieve the international biodiversity targets agreed under the UN Convention, as well those required under the European Union biodiversity strategy.
- 10.2.10 In England, the strategic approach to be taken in biodiversity planning over the period from 2010 to 2020 is set out in '*Biodiversity 2020, A strategy for England's wildlife and ecosystem services*' (Defra, 2011). These country strategies replace the UK Biodiversity Action Plan, with the associated lists of priority habitats and species carried over into the newly defined lists of habitats and species of principal importance for nature conservation in England listed pursuant to Section 41 of the NERC Act. This latter list encompasses 56 habitats and 943 species.
- 10.2.11 The Local Biodiversity Action Plan (BAP) for Lincolnshire is a nature conservation strategy identifying threats to habitats and species within the county and setting out the actions necessary to conserve them through a series of Habitat Action Plans (HAPs) and Species Action Plans (SAPs).
- 10.2.12 Standing advice has been published by Natural England and Defra to guide decision-makers on the determination of proposals with the potential to affect designated sites, species and habitats. The guidance sets out responsibilities and minimum requirements for survey and mitigation, including the need to engage with objectives for no net loss of biodiversity and provision of biodiversity net gain.

10.3 Assessment Methodology

- 10.3.1 The initial EcIA presented in this chapter has been undertaken in accordance with best practice guidance issued by the Chartered Institute of Ecology and Environmental Management (CIEEM) (CIEEM, 2019). Full details of the approach applied are provided in Appendix 10B: Ecological Impact Assessment Methodology in PEI Report Volume III, with an abridged overview provided below. The aims of the ecological impact assessment are to:
- identify relevant ecological features (i.e. designated sites, habitats, species or ecosystems) which may be impacted as a consequence of the Proposed Development;
 - provide a robust assessment of the likely ecological impacts and resultant effects of the Proposed Development, which may be beneficial (i.e. positive) or adverse (i.e. negative);
 - facilitate determination of the consequences of the Proposed Development in terms of national, regional and local policies relevant to nature conservation and biodiversity, where the level of detail provided is proportionate to the scale of the development and the complexity of its potential impacts; and
 - set out the steps to be taken to adhere to legal requirements relating to the relevant ecological features concerned.

- 10.3.2 It is not necessary in the assessment to address all habitats and species with potential to occur in the zone of influence of a proposed development. Instead, the focus should be on those that are 'relevant'. CIEEM guidance makes it clear that there is no need to *"carry out detailed assessment of ecological features that are sufficiently widespread, unthreatened and resilient to project impacts and will remain viable and sustainable"*. This does not mean that efforts should not be made to safeguard wider biodiversity and requirements for this have been considered. National policy documents emphasise the need to achieve no net loss of biodiversity, and enhancement of biodiversity.
- 10.3.3 To support a focussed EclA, there is a need to determine the scale at which the ecological features identified through the desk studies and field surveys undertaken for the Proposed Development are of value. The value of each ecological feature has been defined with reference to the geographical level at which it matters, and the results of this assessment have been used to identify the relevant features requiring impact assessment. The frames of reference used for this assessment, based on CIEEM guidance, are:
- International (generally this is within a European context, reflecting the general availability of good data to allow cross-comparison);
 - National (Great Britain, but considering the potential for certain ecological features to be more notable (of higher value) in an England context relative to Great Britain as a whole);
 - Regional (South Humberside);
 - County (Greater Lincolnshire);
 - District (Stallingborough);
 - Local or Site (ecological features that do not meet criteria for valuation at a District or higher level, but that have sufficient value to merit retention or mitigation); and
 - Negligible (common and widespread ecological features of such low priority that they do not require retention or mitigation at the relevant location to otherwise maintain a favourable nature conservation status).
- 10.3.4 All ecological features of Local value and above have been taken forward to impact assessment, and are the 'relevant ecological features' for the purposes of impact assessment.
- 10.3.5 In line with the CIEEM guidelines, the terminology used within the EclA draws a clear distinction between the terms 'impact' and 'effect'. For the purposes of the EclA, these terms are defined as follows:
- impact – actions resulting in changes to an ecological feature; for example, demolition activities leading to the removal of a building utilised as a bat roost; and
 - effect – outcome resulting from an impact, acting upon the conservation status or structure and function of an ecological feature; for example, killing/injury of bats and reducing the availability of breeding habitat as a result of the loss of a bat roost may lead to an adverse effect on the conservation status of the population concerned.

Significance Criteria

- 10.3.6 For each ecological feature only those characteristics relevant to understanding the ecological effect and determining the significance are described. The determination of the significance of effects has been made based on the predicted effect on the structure and function, or conservation status, of relevant ecological features, as follows:

- not significant - no effect on structure and function, or conservation status; and
- significant - structure and function, or conservation status is affected.

10.3.7 For significant effects (both adverse and beneficial) this is qualified with reference to the geographic scale at which the effect is significant (e.g. an adverse effect significant at a national level).

10.3.8 The CIEEM approach described in Appendix 10B: Ecological Impact Assessment Method in PEI Report Volume III broadly accords with the EIA methodology described in Chapter 2: Assessment Methodology of this PEI Report. However, the matrix has not been used to classify predicted effects, as this deviates from CIEEM guidance. In order to provide consistency of terminology in the final assessment, the findings of the CIEEM assessment have been translated into the classification of effects scale used in other chapters of the PEI Report as outlined in Table 10.1 below.

Table 10.1: Relating CIEEM assessment terms to those used in other PEI Report chapters

EFFECT CLASSIFICATION	TERMINOLOGY USED IN OTHER PEI REPORT CHAPTERS	EQUIVALENT CIEEM ASSESSMENT
Significant (beneficial)	Major beneficial	Beneficial effect on structure/ function or conservation status at regional, national or international level.
	Moderate beneficial	Beneficial effect on structure/ function or conservation status at District or County level.
Non-significant	Minor beneficial	Beneficial effect on structure/ function or conservation status at Site or Local level.
	Neutral	No effect on structure/ function or conservation status.
	Minor adverse	Adverse effect on structure/ function or conservation status at Site or Local level.
Significant (adverse)	Moderate adverse	Adverse effect on structure/ function or conservation status at District or County level.
	Major adverse	Adverse effect on structure/ function or conservation status at Regional, National or International level.

Survey Methods and Scope*Extent of Study Area*

- 10.3.9 The study areas used in this assessment were defined with reference to the likely zone of influence over which the Proposed Development may have potential to result in significant effects on relevant ecological features.
- 10.3.10 It is important to recognise that the potential zone of influence of the Proposed Development may vary over time (e.g. the construction zone of influence may differ from the operational zone of influence) and/ or depending on the individual sensitivities of different ecological features.
- 10.3.11 This was taken into account when defining study areas and these are sufficient to address the potential worst case zone of influence of the Proposed Development on the relevant ecological features concerned.
- 10.3.12 The extent of the study areas applied during the desk study and field surveys are detailed within Table 10.2 and Table 10.3 below, and in Figures 10C.2 and 10C.3 in Appendix 10C in PEI Report Volume III.

Desk Study

- 10.3.13 A desk study was carried out to identify nature conservation designations and protected and notable habitats and species potentially relevant to the Proposed Development. The desk study was carried out using the data sources detailed in Table 10.3 and is reported in detail in the Preliminary Ecological Appraisal (PEA) report in Appendix 10C in PEI Report Volume III.
- 10.3.14 Protected and notable habitats and species include those listed under Schedules 1, 5 and 8 of the WCA, Schedules 2 and 4 of The Habitats Regulations, and species and habitats of principal importance for nature conservation in England listed pursuant to Section 41 of the NERC Act. Other notable habitats and species have also been considered and assessed on a case by case basis (e.g. those included in national Red Data Books and Lists and within the Lincolnshire BAP, but not protected by legislation). This is consistent with the requirements of relevant planning policy.

Table 10.2: Desk study area and data sources

ECOLOGY FEATURE	STUDY AREA	SURVEY METHOD	DATE ACCESSED
International statutory nature conservation designations	10 km	Multi-Agency Geographic Information for the Countryside (MAGIC) website	September 2019
National statutory nature conservation designations	2 km	MAGIC website Natural England website	September 2019
Local non-statutory nature conservation designations	2 km	Greater Lincolnshire Nature Partnership	May 2018
Protected and notable habitats and species	1 km	Greater Lincolnshire Nature Partnership Ecological Assessment of Centrica South Humber	May 2018

ECOLOGY FEATURE	STUDY AREA	SURVEY METHOD	DATE ACCESSED
		Bank Power Station (Humber INCA, 2010) Centrica South Humber Bank Biodiversity Action Plan (Humber INCA, 2011) Lincolnshire BAP (Lincolnshire Biodiversity Partnership, 2011)	
Ponds	250 m	1:25,000 Ordnance Survey maps Aerial photographs (Google Earth) MAGIC website	September 2019
Wintering birds	Site and surrounding fields (Fields 30, 31, 37 & 39 ¹)	Humber Environmental Data Centre	May 2018

Field Surveys

- 10.3.15 The scope of habitat and protected species survey work considered necessary to inform this initial EclA is summarised in Table 10.3. This was determined through a PEA of the Site, as detailed within Appendix 10C: PEA Report in PEI Report Volume III, which also includes the rationale applied when scoping out surveys for certain species or species groups.
- 10.3.16 The Phase 1 Habitat survey area encompassed all habitats within the Main Development Area (green line boundary on the Phase 1 Habitat map) and the Wider Survey Area (red line boundary on the Phase 1 Habitat map) the Site.
- 10.3.17 In addition to the surveys undertaken by AECOM, a survey of the Site was previously undertaken by Humber INCA in 2010 and included a Phase 1 Habitat survey and water vole survey (Humber INCA, 2010).

¹ Field numbering refers to codes used to identify fields subject to survey as part of the Humber Environmental Data Centre's wintering bird survey programme. The Proposed Development is within Field 39.

Table 10.3: Scope and methods of ecological field survey work

ECOLOGY SURVEY	STUDY AREA	SURVEY METHOD	TIMING
Phase 1 Habitat survey	Habitats within the Main Development Area and Wider Survey Area.	Habitats mapped in accordance with Joint Nature Conservancy Council (JNCC), 2010.	May 2018 and October 2019
Reptiles	Suitable habitat for reptiles within and adjacent to the Main Development Area.	Seven visits in suitable weather conditions using artificial refuges in accordance with standard guidance.	July and Sept 2018
Aquatic invertebrates	Suitable ditches within the Main Development Area.	Sampling in accordance with Buglife guidance (Palmer et al., 2013).	June and Sept 2018
Water vole	Suitable ditches within the Main Development Area and Wider Survey Area.	Single visit to survey all banks of ditches.	3 rd October 2018 and 16 th October 2019
Otter	Suitable ditches within the Main Development Area and Wider Survey Area.	Single visit to survey all banks of ditches.	3 rd October 2018 and 16 th October 2019

Wintering Bird Surveys

- 10.3.18 Surveys of the Main Development Area for wintering birds were not undertaken because the Applicant has committed to providing mitigation for the loss of high tide roosting/ loafing and foraging habitat that is functionally linked to the Humber Estuary SPA/ Ramsar via the South Humber Gateway (SHG) strategic mitigation scheme covered by Policy 9 of the Local Plan. This approach was agreed with Natural England through its Discretionary Advice Service (DAS) for the Consented Development EIA.
- 10.3.19 The area of habitat to be drawn down from the SHG strategic mitigation scheme at Cress Marsh, to the south of the Site, has been determined with reference to the wintering bird surveys conducted at the time the SHG scheme was developed in winter 2010/11. The Cress Marsh habitat mitigation site has been constructed and is now functioning. Further wintering bird surveys of the Site are therefore not necessary to inform this calculation.

Surveys Scoped Out

10.3.20 The following protected species surveys were scoped out primarily on the basis of habitat unsuitability following completion of the PEA (further justification is provided in the PEA in Appendix 10C in PEI Report Volume III):

- wintering birds – see rationale above;
- breeding birds – the Main Development Area does not have the potential to support important assemblages of nesting birds. Common species are expected to be nesting within the drains, areas of broadleaved woodland and scrub; and ground nesting species may nest in the open areas of grassland (depending on the grazing regime). Desk study results revealed limited records of breeding birds in the wider area and species such as curlew and lapwing are unlikely to use the enclosed landscape character of the Site. Requirements for mitigation for legislative compliance only are considered in this chapter;
- bats (roosting) – there is no habitat suitable for roosting bats within or adjacent to the Main Development Area. Roosting bats are therefore not considered further in this EclA;
- bats (foraging/ commuting) – habitats present within the Main Development Area are of limited value (lack of linear features, largely grassland) to foraging/ commuting bats, as they are likely to be open and exposed due to their proximity to the banks of the Estuary. Foraging and commuting bats are therefore not considered further in this EclA;
- badger – no signs to indicate the presence of badger setts or activity within the Site or Main Development Area were found during the Phase 1 Habitat surveys/ protected species surveys undertaken in 2018 and most recently in October 2019. A pre-construction ecological walkover survey will be completed if the start of construction is delayed beyond the earliest construction programme scenario set out in Chapter 5: Construction Programme and Management. Badger is therefore not considered further in this EclA;
- great crested newt (GCN) – there are no ponds within the Main Development Area or within 250 m of the Main Development Area. Great crested newt is not considered further in this EclA. However due the presence of a potential hibernacula and ditches with standing water during times of no flow, there is potential for newts to be in the wider area, so a watching brief will be carried out during the ground clearance of the Main Development Area; and
- water shrew (*Neomys fodiens*) – this species was incidentally recorded during the reptile surveys within the Main Development Area and may be present in the surrounding habitats. However, this species is widespread and common and is not considered an important feature for the purposes of EclA. Requirements for mitigation for legislative compliance only are considered in this chapter.

Assessment Scenarios and Parameters

10.3.21 As described in Chapter 4: The Proposed Development and Chapter 5: Construction Programme and Management, there are three possible construction programme scenarios. For the purposes of the EclA there is no significant difference in impacts between the three scenarios, and the construction assessment presented would apply to all.

10.3.22 For the purposes of the EclA it is assumed that the majority of the Main Development Area would be cleared for construction and the maximum dimensions of buildings would

be built. As such a worse case (i.e. the maximum Rochdale Envelope parameters for the Proposed Development as set out in Chapter 4: The Proposed Development) has been assessed in terms of impacts on ecological features within the Site.

Consultation

10.3.23 Comments relevant to the EclA were provided by Natural England and the Marine Management Organisation and summarised in the NELC Scoping Opinion for the Consented Development as follows:

“The location of the proposal close to the Humber Estuary means that the provisions of the Wildlife and Countryside Act 1981 (as amended) and the Habitats Regulations 2010 will apply. Any assessment will need to consider potential impacts of the development close to the designated sites on all of the features of the SSSI, SPA, Ramsar and SAC. SPA Bird species will need to be considered. Moreover consideration will need to be given to Breeding Birds and Protected Species. It is acknowledged that you have undertaken consultation with Natural England and their response is dated 27th July 2018. You are also advised to consider the comments of the Marine Management Organisation dated 13th July 2018.”

10.3.24 The assessment presented within this chapter considers impacts on the designated sites, breeding birds and protected species as required.

10.3.25 An EIA Scoping Opinion was received from the Planning Inspectorate on 2nd October 2019 (see Appendix 1B in PEI Report Volume III). The consultation response by NELC to PINS explained that the EIA Scoping Report captured the relevant information requested by NELC in the scoping opinion in respect of the Consented Development and that NELC have no further comments.

10.3.26 Comments from other stakeholders in the PINS Scoping Opinion in relation to the EclA scope are shown in Table 10.4 below.

Table 10.4: Stakeholder comments from the PINS Scoping Opinion

SURVEY	COMMENT	RESPONSE
Phase 2 botanical survey	It is noted that the Phase 1 habitat survey already carried out provides a detailed species list which will be updated in September 2019. The Inspectorate therefore agrees that further botanical surveys can be scoped out.	This is noted
Wintering birds	The Scoping Report states that there is already sufficient data on bird usage of the affected fields and further surveys would add little new information. In addition, this approach was agreed with Natural England during consultation on the EIA for the extant planning permission. The Inspectorate agrees that further surveys can be scoped out, provided the ES contains sufficient information on the	This is noted

SURVEY	COMMENT	RESPONSE
	wintering bird populations to allow an assessment of likely significant effects.	
Breeding birds	The Scoping Report states that there is little suitable habitat available on the site which could support breeding bird populations. However, there is little supporting evidence in the Scoping Report. The Inspectorate does not agree to this matter being scoped out and an assessment of any likely significant effects associated with this matter should be included in the ES.	As stated at paragraph 10.3.20 above, the Main Development Area does not have the potential to support important assemblages of nesting birds. Common species are expected to be nesting within the drains and areas of broadleaved woodland/ scrub and ground nesting species may nest in the open areas of grassland (depending on the grazing regime). Requirements for mitigation for legislative compliance only are considered in this chapter.
Badgers	Surveys for badgers: The Scoping Report states that there is little suitable habitat available on the site which could support badgers. However, there is little supporting evidence in the Scoping Report to support this statement. The Inspectorate does not agree to this matter being scoped out unless the ES can provide evidence which supports the position that significant environmental effects on badgers are unlikely.	As described at paragraph 10.3.20 above, no signs to indicate the presence of badger setts or activity within the Site or Main Development Area were found during the Phase 1 Habitat survey undertaken in 2018, during subsequent surveys for other protected species in 2018, and during the update Phase 1 Habitat survey in 2019. A pre-construction ecological walkover survey will be completed if the start of construction is delayed beyond the earliest construction programme scenario set out in Chapter 5: Construction Programme and Management.
Study areas	The ES should explain how the study areas used for the different ecological receptors relates to the zone of influence of the Proposed Development.	The rationale for the Study Area is set out above in paragraphs 10.3.9 to 10.3.12.
Potential impacts on ecological features	The list of potential impacts does not appear to include effects associated with decommissioning, operational effects on aquatic habitats and water quality in the surrounding	Decommissioning effects are assessed in paragraphs 10.6.88 – 10.6.89. Operational effects on aquatic habitats are considered in paragraphs 10.6.68 – 10.6.69

SURVEY	COMMENT	RESPONSE
	ditches, and temporary air quality effects resulting from plant and vehicle movements during construction. The ES should assess the effects resulting from these impacts where a likely significant environmental effect would occur.	(Humber Estuary), paragraph 10.6.82 (ditches), paragraph 10.6.84 to 10.6.85` (water vole habitat) and paragraph 10.6.86 to 10.6.87 (otter). Water quality impacts are also assessed in Chapter 14: Water Resources, Flood Risk and Drainage. The air quality assessment presented in Chapter 7: Air Quality concludes that construction traffic and plant emissions will have imperceptible or very low impacts and no significant effects, so this topic is not discussed further in this chapter.
Update of the ecological impact assessment for the Consented Development	The updated ecological impact assessment must take account of the additional generating capacity and its associated effects. The Applicant is advised to agree the scope of the assessment of effects on the Humber Estuary Special Protection Area/ Ramsar/ Site of Special Scientific Interest with Natural England.	The Applicant will consult with Natural England regarding the information to support a Habitat Regulations Assessment for the Proposed Development.

10.4 Baseline Conditions

- 10.4.1 The ecological baseline relevant to the Proposed Development is summarised below. Further details of the findings of desk and field based studies, including evaluation of the relative nature conservation value of identified ecological features, are provided in Appendices 10C (Preliminary Ecological Appraisal), 10D (Aquatic Invertebrate Survey), 10E (Water Vole and Otter Survey) and 10F (Reptile Survey) in PEI Volume III.

Statutory International Nature Conservation Designations within 10 km

- 10.4.2 The Humber Estuary is approximately 175 m east of the Site. The Estuary is designated as a European Marine Site (EMS), encompassing designations as a Special Area of Conservation (SAC), SPA and Ramsar site because of its estuarine and intertidal habitats that support internationally important populations of wintering birds (especially geese, ducks and waders) during the migration periods and in winter. In summer, the Humber Estuary supports important breeding populations of bittern (*Botaurus stellaris*), marsh harrier (*Circus aeruginosus*), avocet (*Recurvirostra avosetta*) and little tern (*Sterna albifrons*). The marine species sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*) and grey seal (*Halichoerus grypus*) are also designated features of the SAC.

10.4.3 There are no other international nature conservation designations within a 10 km radius of the Site, which is the worst case zone of influence defined in Table 10.3. This search radius is sufficient to identify all designations relevant to the assessment of potential air quality impacts.

10.4.4 A signposting report to inform Habitats Regulations Assessment (HRA) of the Proposed Development is presented as Appendix 10G in PEI Report Volume III.

Statutory National and Local Nature Conservation Designations within 2 km

10.4.5 The Humber Estuary is also designated as a Site of Special Scientific Interest (SSSI), the boundary of which largely overlaps with the SPA, SAC and Ramsar designated site boundaries. There are no other statutory national or local nature conservation designations within 2 km of the Site.

Non-Statutory Nature Conservation Designations within 2 km

10.4.6 Four Local Wildlife Sites (LWS) were identified in the desk study area:

- Healing Cress Beds Stallingborough LWS – approximately 0.7 km south-west;
- Sweedale Croft Drain LWS – approximately 0.8 km south-east;
- Laporte Road Brownfield Site LWS – approximately 1 km north-west; and
- Fish Ponds to the West of Power Station, Stallingborough LWS – approximately 1 km south-west.

10.4.7 In addition, two Sites of Nature Conservation Importance (SNCI) were identified; Field West of Power Station Stallingborough SNCI (approximately 30 m south-west) and North Moss Lane Meadow SNCI (approximately 0.9 km north-west). No citations were available for the SNCIs, because they have not been surveyed against the revised Greater Lincolnshire Nature Partnership (GLNP) LWS selection criteria (the LWS designation supersedes the SNCI designation). These sites are therefore not considered further because there is no information available on them.

Habitats

10.4.8 The Main Development Area is bounded to the north by South Marsh Road, to the east by the cooling water pumping station, beyond which is the Humber Estuary, to the west by the South Humber Bank Power Station (SHBPS) and to the south by a large arable field. Further information on the habitats present on the Site is provided in Appendix 10C (PEA) in PEI Report Volume III, and a brief summary is provided below.

10.4.9 The Proposed Development is located on an area of land adjacent to the existing SHBPS that has been created and managed for the benefit of nature conservation since the late 2000s. The land was seeded with a wildflower seed mix.

10.4.10 There are a number of drainage ditches around the margins of the Main Development Area.

10.4.11 The wildflower grassland within the Main Development Area is evaluated to be of District nature conservation value. The grassland meets the GLNP LWS site selection criteria for 'neutral grassland' because the area exceeds 0.1 ha and has eight or more scoring grassland species from the GLNP criteria list. The grassland is not considered to merit county value, despite meeting the LWS selection criteria, because it originates relatively recently from a sown seed mixture. As such, the grassland does not represent long-standing grassland habitat.

- 10.4.12 The ditches do not support habitats notable on their own merits and instead have been valued in terms of their importance for the protected species otter and water vole, and their aquatic invertebrate interest (see below).

Protected and Notable Species

- 10.4.13 The following protected and notable ecology species were identified either as present in association with the Site, or potentially within the zone of influence of the Proposed Development:

- breeding birds (including peregrine falcon (*Falco peregrinus*));
- wintering birds (on Site and in adjacent habitats);
- reptiles;
- water vole;
- otter; and
- aquatic invertebrates.

Breeding Birds

- 10.4.14 The habitats within the Main Development Area provide limited opportunities for nesting birds, although ground nesting birds such as skylark (*Alauda arvensis*) and meadow pipit (*Anthus pratensis*) may be present. Birds may also utilise the ditches within the Main Development Area for foraging.

- 10.4.15 Breeding birds noted during the course of the Phase 1 Habitat survey (2018) that may nest in habitats within the Main Development Area included sedge warbler (*Acrocephalus schoenobaenus*), reed warbler (*Acrocephalus scirpaceus*), reed bunting (*Emberiza schoeniclus*), yellow wagtail (*Motacilla flava*) and linnet (*Carduelis cannabina*). Based on the habitats recorded, the Main Development Area can be expected to support an assemblage of up to Site value.

- 10.4.16 The Applicant has confirmed the presence of nesting peregrine falcon (*Falco peregrinus*) at SHBPS, which is adjacent to the Main Development Area. A pair of peregrine falcons was incidentally recorded during several other surveys undertaken at the Site in 2018, and it is assumed that this pair nests on SHBPS. Peregrine falcons are listed on Schedule 1 (Wildlife and Countryside Act 1981 (as amended)), for which there are additional offences of disturbing these birds at their nests, or their dependent young. The UK population of this species has increased substantially in recent times thought likely due to an increase in conservation efforts and control of persecution, as well as the adaptability of the species to exploit previously unused nesting sites e.g. in urban environments (Banks et al., 2003). It is evaluated that this species is of Local nature conservation value.

Wintering Birds (Site)

- 10.4.17 The Proposed Development occupies a parcel of grassland in close proximity to the Humber Estuary SPA/ Ramsar, in which a number of shallow scrapes have been constructed to attract feeding, loafing and roosting birds at high tide that are displaced from coastal mudflats. This area where scrapes have been constructed is referred to as 'Field 39' in the South Humber Bank Wintering Bird Surveys undertaken in 2007/08 and 2010/11 to inform the SHG strategic mitigation approach (Policy 9 in the NE Lincolnshire Local Plan).

- 10.4.18 Surveys of the Site in winter 2007/ 08 recorded very few SPA/ Ramsar birds. Turnstone were recorded in small numbers (1 or 2 birds) at the far eastern end of the field (i.e.

nearest to the coastal mudflats) in November, December, January, February and March across this period. The only other species recorded were redshank (one record of 1 bird in December 2017, and curlew (two records of 7 birds in January 2008, and one record of 1 bird in April 2008). No birds were recorded in the field in the 2010/11 surveys. A summary of the peak counts of birds in the 2007/08 survey season is provided in Table 10.5, with comparison against the Humber Estuary 5-year peak mean counts (from Frost *et al.*, 2018) and the thresholds for international importance.

- 10.4.19 Despite the low numbers of records of SPA/ Ramsar birds within the Main Development Area, and that none were recorded in numbers above the 1% threshold of the Humber Estuary population², given its proximity to the Humber Estuary it is considered to be functionally linked to the Humber Estuary SPA/ Ramsar. A precautionary approach has been taken to the assessment, because the survey data are now somewhat out of date and the plot may have become more suitable for wintering birds in the interim period due to sensitive management of the grassland on the Site. The Site is therefore evaluated to be of District nature conservation value to wintering birds.

Table 10.5: Peak counts and importance of Site to wintering birds (Field 39)

SPECIES	PEAK COUNT ON SITE (2007/08)	HUMBER ESTUARY 5-YEAR MEAN PEAK COUNT	PERCENTAGE OF HUMBER ESTUARY POPULATION ON SITE	THRESHOLD FOR INTERNATIONAL IMPORTANCE
Turnstone	2	249	0.8%	1,400
Redshank	1	3,368	0.03%	2,400
Curlew	7	2,806	0.2%	8,400

Wintering Birds (Field to the South)

- 10.4.20 The large arable field to the south of the Site, for which the southern boundary is defined by Oldfleet Drain, is referred to as 'Field 37' in the South Humber Bank counts.
- 10.4.21 This field regularly supports lapwing, curlew and golden plover across the winter months, and is noted to be an important field in the South Humber Bank survey area for high tide roosting, loafing and feeding birds. Although outside the Humber Estuary SPA/ Ramsar designated site boundary, this field is considered to be functionally linked to the SPA/ Ramsar. A summary of the survey results, with the peak counts from the three seasons of survey in 2006/07, 2007/08 and 2010/11 is provided in Table 10.6, with comparison against the Humber Estuary 5-year mean peak counts (from Frost *et al.*, 2018) and thresholds for international importance.
- 10.4.22 Sparrowhawk, buzzard (*Buteo buteo*), peregrine falcon and barn owl (*Tyto alba*) were all recorded hunting over the field during the survey period. Other records were made during the survey period of snow bunting (*Plectrophenax nivalis*) and snipe (*Gallinago gallinago*).

² The 1% threshold of the Humber Estuary population is used to identify key terrestrial areas within the Estuary that support the SPA/ Ramsar assemblage, and which would be considered to be of County or higher importance.

10.4.23 This field is evaluated as being of Regional importance to nature conservation for its wintering and passage bird assemblage, for which several key SPA/ Ramsar species have been recorded in numbers above the 1% threshold of the Humber Estuary population. The eastern part of this field has been allocated for waterbirds as part of the SHG strategic mitigation strategy.

Table 10.6: Peak counts and importance of Site to wintering birds (Field 37)

SPECIES	PEAK COUNT ON SITE (2006/07 – 2010/11)	HUMBER ESTUARY 5-YEAR MEAN PEAK COUNT	PERCENTAGE OF HUMBER ESTUARY POPULATION ON SITE	THRESHOLD FOR INTERNATIONAL IMPORTANCE
Curlew	75	2,806	2.7%	8,400
Golden plover	228	33,994	0.7%	9,300
Lapwing	510	11,702	4.4%	20,000
Ringed plover	17	1,089	1.6%	730
Black-tailed godwit	15	2,951	0.5%	610
Mallard	46	1,204	3.8%	20,000

Wintering Birds (Fields to the North)

10.4.24 Two large arable fields to the north of the Proposed Development (on the north side of South Marsh Road) were also included within the baseline study area; these are Fields 30 and 31 in the South Humber Bank counts.

10.4.25 These fields are also considered to be functionally linked to the Humber Estuary, and although in the most recent survey years they have supported very low numbers of birds, peak counts in 2006/07 for golden plover and lapwing were particularly significant. A summary of the survey results, with the peak counts from the three seasons of survey in 2006/07, 2007/08 and 2010/11 is provided in Table 10.7, with comparison against the Humber Estuary 5-year mean peak counts (from Frost *et al.*, 2018) and thresholds for international importance.

10.4.26 This field is evaluated as being of Regional importance to nature conservation for its wintering and passage bird assemblage, for which several SPA/ Ramsar species have been recorded in numbers well above the 1% threshold of the Humber Estuary population.

Table 10.7: Peak counts and importance of Site to wintering birds (Fields 30 and 31)

SPECIES	PEAK COUNT ON SITE 2006/07 – 2010/11	HUMBER ESTUARY 5-YEAR MEAN PEAK COUNT	PERCENTAGE OF HUMBER ESTUARY POPULATION ON SITE	THRESHOLD FOR INTERNATIONAL IMPORTANCE
Curlew	41	2,806	1.5%	8,400
Golden plover	3,600	33,994	10.6%	9,300
Lapwing	1,130	11,702	9.7%	20,000
Ringed plover	16	1,089	1.5%	730
Mallard	6	1,204	0.5%	20,000

Wintering Birds (Coastal Mudflats)

10.4.27 The nearest coastal mudflats to the Site are within the boundary of the Humber Estuary SPA/ Ramsar, and are approximately 175 m from the eastern boundary of the Main Development Area. This is an extensive area of mudflat referred to as the 'Pyewipe mudflats', which extend from the southern end of Immingham Docks south to Grimsby Docks. This mudflat supports large aggregations of birds, particularly black-tailed godwit for which this part of the Estuary is favoured by this species. As they form part of the Humber Estuary SPA/ Ramsar designation this area of mudflats is considered to be of International importance for the purposes of assessment.

Reptiles

10.4.28 The habitats within the Site boundary were appraised in the PEA as being of potential suitability for grass snake (*Natrix helvetica*) and common lizard (*Zootoca vivipara*).

10.4.29 The habitats within the Main Development Area were subsequently surveyed for reptiles, and the survey results are presented in Appendix 10F (Reptile Survey Report) in PEI Report Volume III. No reptiles were recorded during the surveys. However, given the suitability of the ditch habitats for foraging and basking grass snake, it is considered that there remains a risk that this species may be present on occasion on a transitory basis. Given the lack of reptile records during the surveys, the Main Development Area is evaluated as being of low suitability for reptiles. Reptiles are therefore scoped out of the EclA, except for consideration of requirements for precautionary mitigation to address the low residual risk of grass snake being present on a transitory basis.

Water Vole

10.4.30 Previous surveys of the Site (Humber INCA, 2010) confirmed the presence of water vole in ditches surrounding the perimeter of the Site. The water vole survey undertaken in early October 2018 found limited evidence of water voles, with only a small number of water vole burrows and latrines recorded. There were also *ad-hoc* reports of characteristic water vole 'plops' in the ditches during the undertaking of other surveys on the Site. It has not been possible to calculate a population size class assessment given the limited number of latrines recorded.

10.4.31 A repeat water vole survey was undertaken in October 2019 and no evidence of water vole activity was recorded, however vegetation around the ditches had been strimmed recently and this may have affected the results of the survey.

- 10.4.32 The desk study returned numerous records of water vole in the desk study area, and it appears that the species is widespread and common in the local area, including on Oldfleet Drain to the south of the Site (Atkins, 2018). The Lincolnshire BAP states that the county is considered a national stronghold for water vole. The population of water voles within the Main Development Area is therefore evaluated to be of District nature conservation value.

Otter

- 10.4.33 Fresh otter spraints were recorded on a reptile mat close to the ditch which runs along the southern boundary of the Main Development Area in early September 2018. An older spraint was recorded on an outfall pipe on the ditch along the western boundary of the Site. No evidence of otter activity was recorded in 2019, and there is no suitable habitat to support resting otter within the Main Development Area, however it is likely that otters are foraging throughout the ditch networks, which are well connected to coastal habitats and further ditches running north-south along the landward base of the flood embankment, as well as other good quality otter foraging habitat on Middle Drain (north of the Site) and Oldfleet Drain (south of the Site).
- 10.4.34 Otter is noted in the Lincolnshire BAP to be present in all river catchments in the county, and was subsequently removed from the list of Species Action Plans in the third edition of the BAP (having been included in the second edition) due to its widespread nature. Otters within the Main Development Area are therefore evaluated as being of Local nature conservation value.

Aquatic Invertebrates

- 10.4.35 None of the aquatic invertebrates recorded within the surveyed waterbodies receive specific legal protection by way of Schedule 5 of the WCA, or are listed pursuant to Section 41 of the NERC Act as being of principal importance for nature conservation in England. Survey results are presented in Appendix 10D (Aquatic Invertebrates Survey Report) in PEI Report Volume III.
- 10.4.36 The three ditches surveyed were found to support a moderate diversity of aquatic macroinvertebrates considered fairly typical of a small, slow flowing drain.
- 10.4.37 Only one notable aquatic invertebrate species was recorded. This was smooth ram's-horn snail (*Gyraulus laevis*) which was recorded from Ditch 2 (which runs approximately north-south in the southern part of the Main Development Area – see Appendix 10D, Annex A in PEI Report Volume III). This snail species is associated with shallow, slow flowing waters, rivers, lakes and ponds, usually found on weeds but sometimes on muddy bottoms and on stones. It is Nationally Scarce, and although not currently threatened in Great Britain, is suffering from adverse habitat loss (Seddon *et al.*, 2014).
- 10.4.38 Ditch 1 (which runs approximately east-west along the south-eastern boundary of the Main Development Area) and Ditch 3 (which runs along the northern boundary of the Main Development Area) (see Appendix 10D, Annex A in PEI Report Volume III) are evaluated as being of Local nature conservation value. Ditch 2 is evaluated as being of District nature conservation value as it supported a higher diversity of aquatic macroinvertebrates, including the Nationally Scarce smooth ram's-horn snail.

Summary of Baseline

- 10.4.39 A summary of the baseline ecology conditions at the Main Development Area is provided in Table 10.8 below. As discussed in the methods section, all ecology features valued at Local level or above have been taken forward for impact assessment, where there is the potential for these features to be affected either directly or indirectly.

Table 10.8: Summary of baseline ecology features

ECOLOGY FEATURE	NATURE CONSERVATION VALUE	JUSTIFICATION	TAKEN FORWARD FOR ASSESSMENT?
Humber Estuary SPA/ SAC/ Ramsar/ SSSI (which together comprise the Humber Estuary European Marine Site)	International	Site supports qualifying features under the relevant EC Directives that are of international importance.	Yes – potential for direct and indirect effects on habitats and qualifying features
Healing Cress Beds LWS	County	Meets LWS selection criteria.	Yes – potential for air quality impacts
Sweedale Croft Drain LWS	County	Meets LWS selection criteria.	Yes – potential for air quality impacts
Laporte Road Brownfield Site LWS	County	Meets LWS selection criteria.	Yes – potential for air quality impacts
Fish Ponds to the West of Power Station, Stallingborough LWS	County	Meets LWS selection criteria.	Yes – potential for air quality impacts
Semi-improved neutral grassland	District	Grassland meets the area and species-diversity criteria for LWS selection in the greater Lincolnshire area, but has originated relatively recently from a sown mixture.	Yes – this habitat will be entirely lost to the Proposed Development
Breeding birds (non-Schedule 1)	Site	Small number of breeding pairs likely to be present within broadleaved woodland and scrub habitat; and ground-nesting birds in grassland habitat. Reeds in ditches also provide suitable nesting habitat for a range of species.	No
Breeding birds (Schedule 1)	Local	Pair of peregrine falcons nesting on SHBPS.	Yes – although outside the Main Development Area, potential for impacts to nesting peregrine falcon as a

ECOLOGY FEATURE	NATURE CONSERVATION VALUE	JUSTIFICATION	TAKEN FORWARD FOR ASSESSMENT?
			result of noise and visual disturbance during construction.
Wintering birds (Site)	District	Habitats on Site support very low numbers of SPA/ Ramsar birds, but are still considered to be functionally linked to the SPA/ Ramsar due to their proximity to the coastal environment.	Yes – habitats will be lost to the Proposed Development
Wintering birds (off Site)	Regional	Habitats off Site support important aggregations of wintering/ passage birds including those that are the qualifying features of the Humber Estuary SPA/ Ramsar wintering assemblage.	Yes – potential for indirect impacts such as noise/ vibration and visual disturbance during construction and operation
Wintering birds (Pyewipe mudflats within Humber Estuary SPA/ Ramsar)	International	Coastal mudflats adjacent to the Site support important assemblages of waterbirds and are within the boundary of the Humber Estuary SPA/ Ramsar	Yes – potential for indirect impacts such as noise and visual disturbance during construction and operation.
Reptiles	Absent	-	No
Water vole	District	Present on all perimeter ditches within the Proposed Development boundary. Widespread in the county but populations have declined substantially across the UK.	Yes – potential for direct and indirect impacts on habitats
Otter	Local	Recorded on Site, likely to use all suitable ditches within Proposed	Yes – potential for direct impacts and loss of foraging habitat

ECOLOGY FEATURE	NATURE CONSERVATION VALUE	JUSTIFICATION	TAKEN FORWARD FOR ASSESSMENT?
		Development boundary (foraging otter only). Widespread in the county.	
Aquatic invertebrates	Local for Ditches 1 and 3 District for Ditch 2	Presence of diverse aquatic macroinvertebrates including the Nationally Scarce smooth ram's-horn snail.	Yes – potential for direct impacts

Future Baseline*At Construction*

- 10.4.40 It is reasonable to assume that the current grassland and ditch management regime would continue in the absence of development, and therefore the habitats within the Main Development Area would not be expected to change over this timeframe. Similarly, it is reasonable to assume that any protected species potentially present within the Main Development Area and wider Site (breeding birds, wintering birds, water vole and otter) would remain present in these habitats over this timeframe.
- 10.4.41 The surrounding fields, assuming they remain under arable cultivation (or some are enhanced as part of the strategic habitat mitigation proposals for the South Humber Industrial Investment Programme (SHIIP)), would also be expected to maintain their suitability for high tide feeding, roosting and loafing SPA/ Ramsar birds.
- 10.4.42 If construction of the Consented Development commences in early 2020, the future baseline conditions at the Main Development Area at the start of the Proposed Development's construction would comprise a construction site with minimal vegetation. The ditches would continue to provide water vole and otter habitat, but there would be no suitable habitat for wintering birds within the Main Development Area. Limited habitat would be present for breeding birds. The main assessment presented in Section 10.6 below assesses the impacts and effects of the Proposed Development against a future baseline without the Consented Development, then the effects of the Proposed Development are compared to a future baseline with the Consented Development.

At Opening

- 10.4.43 Again, assuming the current management of the Site continues in the absence of development, there would be no changes in the habitat or protected species baseline expected over this timeframe. The main assessment presented in Section 10.6 below assesses the impacts and effects of the Proposed Development against this future baseline without the Consented Development.
- 10.4.44 If the Consented Development is progressed, the future baseline for comparison would be the completed and operational Consented Development, including new mitigation habitat (grassland and pond) created to the west of SHBPS. An assessment of the effects of the Proposed Development compared to a future baseline with the Consented Development is presented at the end of Section 10.6.

At Decommissioning

- 10.4.45 Over a longer timeframe, again in the absence of development and assuming the current management of the Site continues (i.e. annual grass cutting and cutting back of ditch vegetation), it is reasonable to assume there will be no significant changes in the majority of the baseline habitats.
- 10.4.46 The value of the surrounding arable fields to waterbirds may change (for better or worse) over this timeframe. There has been a general decline in many bird species recorded in the Humber Estuary SPA/ Ramsar, and increases in others. The exact reasons for these changes are not known, but may be linked to climate change and breeding success in their summer breeding grounds, many of which are outside the UK.
- 10.4.47 The coastal sea defences to the east of the Proposed Development fall within Policy Unit L of the Humber Estuary Shoreline Management Plan (SMP) (Scott Wilson, 2010). The policy for this stretch is to 'hold the line' for all epochs covered by the SMP, which extends to 2105. Throughout this period, further action will be taken to sustain the current level of flood risk in the future in response to the potential increase in risk from climate change. The SMP concluded that this may result in limited managed realignment being required due to the potential impacts on the intertidal environment associated with the Humber Estuary SAC/ SPA/ Ramsar as a result of the interruption of coastal processes and the effects of coastal squeeze. This section of coastline may therefore decline in its suitability for waterbirds over the future baseline scenario. This may lead to a corresponding decrease in the numbers of waterbirds using the coastal fields surrounding the Proposed Development.
- 10.4.48 The future baseline for comparison if the Consented Development is progressed would be the decommissioning of the Consented Development within the Site. The main assessment presented in Section 10.6 below assesses the impacts and effects of the Proposed Development against a future baseline without the Consented Development, then the effects of the Proposed Development are compared to a future baseline with the Consented Development.

10.5 Development Design and Impact Avoidance

- 10.5.1 The design process for the Proposed Development has included consideration of ecological constraints and has incorporated, where possible, measures to reduce the potential for adverse ecological effects, in accordance with the mitigation hierarchy and relevant planning policy. The measures identified and adopted include those that are inherent to the design of the Proposed Development, and those that can realistically be expected to be applied as part of construction environmental best practice, or as a result of legislative requirements.
- 10.5.2 The development design and impact avoidance measures have been, or would be, adopted during the construction, operation and decommissioning phases of the Proposed Development. These are set out below.

Construction*Measures to Avoid Impacts on the Humber Estuary SPA/ Ramsar*

- 10.5.3 The calculation of the sum of money required for the application of Policy 9 to the Proposed Development (to contribute towards the SHG strategic mitigation land that has been delivered at Cress Marsh, which is part of a wider package of 120 ha of strategic mitigation land to be delivered in the SHG region for the SHIP) was undertaken for the Consented Development. The same will apply to the Proposed Development as the area of land to be lost is the same. This ensures that the loss of functionally linked land within the footprint of the Proposed Development will not result

in adverse effects on the integrity of the Humber Estuary SPA/ Ramsar, and is therefore compliant with the Habitat Regulations see Appendix 10G³ in PEI Report Volume III.

- 10.5.4 The total sum of money to be commuted to NELC to contribute to the SHG mitigation scheme is calculated as follows: $\text{Site Area}^4 \times \text{£11,580}$. The financial contribution for the Consented Development was secured by a Section 106 agreement and this provision would be varied to ensure that the financial contribution would also be secured for the Proposed Development (although the sum would only need to be paid once, for either the Consented Development or the Proposed Development, as explained above).
- 10.5.5 In addition, a close board fence approximately 2.5 m in height will be installed along part of the southern boundary of the Site (see Figure 4.2 in PEI Report Volume II), to provide visual screening during construction and operation to the adjacent field to the south (Field 37). This field has been identified as a key high tide roost for SPA/ Ramsar waterbirds, and the eastern portion of the field is allocated as part of the SHG strategic mitigation package for the SHIP (referred to in the SHIP documents as 'Mitigation Site C').

Measures to Avoid Impacts on Water Vole

- 10.5.6 The layout of the Proposed Development has been designed to accommodate a minimum 5 m undeveloped buffer zone along the banks of all perimeter ditches, to avoid damage and disturbance to the main water vole habitats (i.e. the ditches) associated with the Main Development Area during construction and operation (with the exception of the new site access which will cross the northern perimeter ditch). The buffer zone will be fenced from the Proposed Development to prevent accidental damage during construction.

General Good Practice

- 10.5.7 The construction phase of the Proposed Development will comply with industry good practice and environmental protection legislation during construction in relation to prevention of surface and ground water pollution, fugitive dust management and noise prevention or amelioration. In support of this, the construction contractor will prepare and implement a Construction Environmental Management Plan (CEMP) detailing all requirements for environmental protection and legal compliance. A Framework CEMP is provided in Appendix 5A (PEI Report Volume III).
- 10.5.8 To ensure legislative compliance in relation to nesting birds, all clearance of suitable vegetation (notably any areas of scrub) during site preparation would be undertaken outside the breeding season (which is typically March-August inclusive for most avian species), where possible. In situations where this is not possible, an ecologist would survey the working area for nests before works commence. If nests were discovered, appropriate mitigation would be implemented to ensure that they are not disturbed or destroyed before any works can commence in that area. This would include imposing

³ This impact avoidance habitat has not been taken into account in the Stage 1 HRA screening, because the recent People Over Wind ruling means that impact avoidance/ embedded mitigation cannot be taken into account when determining the potential for likely significant effects. However, the HRA has concluded no adverse effects on integrity at Stage 2 Appropriate Assessment.

⁴ This will be calculated based on the footprint of the Main Development Area.

an appropriate exclusion zones between the works and nest(s) and suspending vegetation clearance works within the area until any young had fledged.

- 10.5.9 Precautionary measures will be implemented to prevent trapping wildlife in construction excavations, in order to ensure compliance with animal welfare legislation. Any excavations deeper than 1 m would be covered overnight, or where this is not practicable, a means of escape would be fitted (e.g. battered soil slope or scaffold plank situated at or below a 45° angle), to allow animals (e.g. otter) to vacate excavations should they fall in.
- 10.5.10 An ecological watching brief will be carried out during ground clearance of the Main Development Area at the start of the construction phase, including removal of the artificial hibernaculum (see Appendix 10C in PEI Report Volume III, Target Note 5 on Figure 10C.4) and the two hay piles (Appendix 10C, Target Note 4 on Figure 10C.4) to prevent harm to reptiles and amphibians that may be present.
- 10.5.11 Construction temporary lighting would be arranged so that glare is minimised outside the construction site. Measures to minimise the impact of lighting will be detailed in the CEMP.
- 10.5.12 If construction is delayed to one of the later construction programme scenarios as set out in Chapter 5: Construction Programme and Management, an update ecological walkover survey will be required to confirm there are no changes to the baseline conditions, particularly with regard to mobile species such as badger.

Operation

- 10.5.13 Lighting impacts beyond the Site boundary will be minimised as far as possible, for example by directing lighting away from adjacent habitats, in accordance with the lighting design for the scheme.
- 10.5.14 Air quality impacts on designated sites will be minimised through the use of design constraints such as stack heights, air exit velocities and temperatures to aid dispersion of pollutants, and emissions monitoring to demonstrate continued compliance with emission limit values set by the Environment Agency through an Environmental Permit required for the operation of the Proposed Development.
- 10.5.15 Surface water discharge will be attenuated to green-field run-off rates and therefore there would be no changes in the flow rate within the adjacent drainage ditches. There is therefore no potential for adverse operational effects on the ditch habitats and the protected species they support (water vole).

Decommissioning

- 10.5.16 Further site surveys will be undertaken in advance of decommissioning works, to determine the status of protected species and to evaluate the habitats present that may be impacted. Relevant avoidance and mitigation measures would be specified and implemented with reference to the findings of the above surveys.
- 10.5.17 The following measures will be implemented as appropriate:
- survey findings and associated mitigation requirements will be discussed and agreed with stakeholders as required prior to the start of works;
 - relevant stand-off working distances will be identified by the project ecologist and implemented to avoid effects, where practicable, particularly along the banks of ditches where a minimum 5 m buffer zone should be achieved (if water vole is still present);

- all necessary protected species licences will be obtained to derogate unavoidable impacts on relevant protected species. Mitigation and monitoring will be implemented in accordance with the requirements of the relevant licences;
- works will be planned to avoid key risk periods (seasons) where appropriate and practicable; and
- relevant works will be undertaken under the supervision of an Ecological Clerk of Works to deliver compliance with relevant legislation and approved mitigation.

10.6 Likely Impacts and Effects

The Proposed Development

- 10.6.1 The impacts and effects of the Proposed Development compared to a future baseline without the Consented Development are described below.

Construction

- 10.6.2 This section describes the impacts and potential effects during the construction phase of the Proposed Development on relevant ecological features in the absence of any mitigation, over and above that which is inherent to the design.
- 10.6.3 To enable a focussed impact assessment, screening was undertaken of potential impacts of the construction phase that are likely to result in adverse or beneficial effects on relevant ecological features and that require further impact assessment. The relevant impacts are taken forward in the more detailed impact assessment that follows. Those impacts that are considered unlikely to result in effects are scoped out and not considered further.
- 10.6.4 The following potential source-receptor pathways have been scoped out of the impact assessment:
- dust smothering of habitats within the Humber Estuary SAC/ SSSI – there are no terrestrial SAC/ SSSI habitats within the zone of influence of fugitive dust emissions during the construction phase, which is reasonably expected to be very small (see Chapter 7: Air Quality). The nearest terrestrial habitat within the designations (coastal saltmarsh) is approximately 500 m from the Main Development Area, and at this distance no dust smothering would be anticipated;
 - noise/ visual disturbance to SPA/ Ramsar qualifying breeding bird species (bittern, marsh harrier, avocet and little tern) – there is no suitable habitat for the qualifying species of breeding birds within the potential zone of influence of noise and visual disturbance arising from the construction of the Proposed Development. There is therefore no pathway by which these features could be affected by the construction of the Proposed Development;
 - noise/ visual disturbance to birds within the SHG mitigation area at Cress Marsh, which is approximately 500 m south-west of the Main Development Area – all construction activities will be on the eastern side of the SHBPS, which provides screening of the construction works to waterbirds using the Cress Marsh mitigation area.
 - vibration impacts on the Humber Estuary SPA/ Ramsar – this pathway was scoped out of assessment based on distance and baseline conditions (see Chapter 8: Noise and Vibration); and
 - air quality impacts on intertidal and subtidal habitats in the SAC/ SSSI – intertidal habitats are not susceptible to the effects of changes in air quality arising from

construction (through dust deposition and smothering of habitats) because of their regular tidal inundation. Subtidal habitats have similarly been scoped out.

10.6.5 Impacts during the construction period that have potential to result in significant effects on relevant ecological features, and which were screened into the impact assessment, are considered further below:

- potential effects on Humber Estuary SAC/ SPA/ Ramsar/ SSSI (loss of functionally linked habitat for wintering birds, noise/ vibration and visual disturbance and surface water pollution);
- loss of semi-improved neutral grassland;
- potential effects on aquatic invertebrates (loss/ damage to habitat and surface water pollution);
- potential effects on Schedule 1 breeding birds (disturbance), specifically peregrine falcon;
- potential effects on water vole (loss/ damage to habitat, noise and visual disturbance); and
- potential effects on otter (loss/ damage to habitat, noise and visual disturbance).

Potential Effects on Humber Estuary SAC/ SPA/ Ramsar/ SSSI During Construction

Loss of High Tide Roosting/ Loafing/ Feeding Habitat that is Functionally Linked to the SPA/ Ramsar

10.6.6 Although the habitat within the Site boundary has been demonstrated to support low numbers of SPA/ Ramsar waterbirds, and there have been no recorded aggregations above 1% of the Humber Estuary threshold, a precautionary approach has been applied to the Proposed Development because it lies within the Mitigation Zone to which Policy 9 is applicable. This states that “...proposals which adversely affect the Humber Estuary SPA/ Ramsar site due to the loss of functionally linked land will normally be required to provide their own mitigation in order to comply with the requirements of the Habitats Regulations”.

10.6.7 To ensure Habitats Regulations compliance for the Proposed Development, it has been assumed that the land within the Proposed Development boundary is ‘functionally linked’ to the Humber Estuary SPA/ Ramsar. This policy has therefore been applied to the Site and the Proposed Development. Taking into account this embedded mitigation, the Proposed Development is assessed to give rise to a neutral effect on the Humber Estuary SPA/ Ramsar as a result of the loss of functionally linked habitat.

Noise Disturbance to Qualifying SPA/ Ramsar Wintering Bird Assemblage at Pyewipe Mudflats

10.6.8 A noise impact assessment has been completed, and baseline monitoring and noise modelling undertaken to determine whether the Proposed Development would result in any construction phase noise impacts on waterbirds in the nearest part of the Humber Estuary SPA/ Ramsar (see Chapter 8: Noise and Vibration), which is at the Pyewipe mudflats (represented by Receptor R3 on Figure 8.1 in PEI Report Volume II). The dB L_{Aeq,1h} values provide an ‘average’ of noise levels expected to occur in any one hour as a result of each activity. Such ‘continuous equivalent noise levels’ form the basis of most noise assessment protocols, but are of limited relevance when considering the effect of noise on waterbirds because waterbirds are perceived to be more susceptible to being disturbed by short, sharp ‘peaks’ of noise e.g. during piling (IECS, 2009). Therefore for piling activities, the L_{Amax} values have been predicted at the nearest

sensitive receptors to provide an indication of the likely 'peak' noise events so that they can be compared to the ambient conditions.

- 10.6.9 Ambient noise levels at noise receptor R3 (on the seawall at the edge of the Humber Estuary SPA/ Ramsar boundary) were recorded at 52 – 58 dB $L_{Aeq,T}$ (see Table 8.14 in Chapter 8: Noise and Vibration). The main sources of noise at this location were found to be waves breaking along the shoreline and birdsong. Occasional vehicle usage along the top of the sea wall (motorbikes and quad bikes) resulted in an increase in ambient noise, with a peak noise range of 51.3 – 77.7 dB $L_{AFMax15 min}$.
- 10.6.10 Predicted noise levels for the majority of construction activities at R3 were predicted to be within the range 47 – 52 dB $L_{Aeq,1hr}$, which is within the ambient range at the nearest part of Pyewipe mudflats. There will therefore be no discernible change in the noise levels reaching the Humber Estuary SPA/ Ramsar during the majority of the construction phase of the Proposed Development.
- 10.6.11 The noisiest construction activity that potentially could be used is drop hammer piling, which the modelling predicts will result in noise levels of 62 dB $L_{Aeq,1hr}$ at R3, which represents an exceedance in the ambient noise level by up to 4 dB. In addition, the type of noise being emitted by drop hammer piling (regular impulsive high noise levels) may be considered as more disturbing to birds. An estimation of the peak noise from piling activity results in predicted levels of 75 dB L_{Amax} at the nearest part of the Estuary. This is significantly higher than the ambient noise level at the measured location on the edge of the Estuary, although as discussed above it is reasonable to assume that there would be some attenuation due to the topography of the seawall, and the fact that the mudflats are below the level of the measured receptor location.
- 10.6.12 Previous studies such as IECS (1999) and ERM (1996) have demonstrated that birds occupying mudflats elsewhere in the Estuary, such as the Salt End and Pyewipe mudflats, are relatively tolerant of piling noise levels (e.g. marine piling to construct new jetties). Based on bird behaviour and noise monitoring studies undertaken by Xodus Group during construction piling for the Grimsby River Terminal (Xodus Group 2012), the significance criteria for disturbance to birds are summarised below:
- ≤ 65 dB L_{AmaxF} – negligible;
 - > 65 to ≤ 75 dB L_{AmaxF} – minor adverse;
 - > 75 to ≤ 85 dB L_{AmaxF} – moderate adverse; and
 - > 85 dB L_{AmaxF} – major adverse.
- 10.6.13 The significance levels in the Xodus study were determined based on the visible responses of waterbirds to noise stimuli and included a variety of behaviours including a 'heads-up' response, physical movement on the ground away from the disturbance source and taking flight.
- 10.6.14 Predicted noise levels across the nearest mudflats are below 44 dB $L_{Aeq,1hr}$, and are therefore within the ambient range. However, the peak noise clearly results in a much greater increase in baseline noise levels to which waterbirds may be more susceptible. It is therefore reasonable to conclude that noise impacts (taking into account the regular impulsive nature of piling noise, and thus its higher likelihood of disturbance to birds) would result in a minor adverse effect on waterbirds at Pyewipe Mudflats that is not significant.

Noise/ Vibration Disturbance to Qualifying SPA/ Ramsar Wintering Bird Assemblage in Adjacent Field to the South

- 10.6.15 The noise impact assessment also considers the potential for noise and vibration impacts during construction on the fields to the south of the Proposed Development (i.e. field 37), which although outside the boundary of the Humber Estuary SPA/ Ramsar is considered to be functionally linked due to the important aggregations of wintering waterbirds present (see Chapter 8: Noise and Vibration).
- 10.6.16 Baseline noise levels were monitored along the southern edge of the Proposed Development at location LT3. This therefore represents the nearest part of the field 37 to the Proposed Development, and is considered to be the worst case for assessment of effects on this receptor because in reality, the majority of waterbirds will be orientated towards the centre of the field/ towards the eastern edge that borders the Estuary (for predator avoidance reasons).
- 10.6.17 Noise at this location was generally dominated by noise from the SHBPS, as well as noise from the associated cooling water pumping station and the adjacent chemical plant (Synthomer). Ambient noise levels were in the range 47 – 53 $L_{Aeq,T}$ and 49 – 65 dB L_{AFmax} .
- 10.6.18 Predicted noise levels arising from construction at this location are in the range 42 – 73 dB $L_{Aeq,1hr}$, at the nearest modelled receptors (on the boundary fence), with the noisiest activity assessed, as expected, being the drop hammer piling. This represents an increase of up to 20 dB on the ambient noise levels, which is a significant increase. However, this would be the worst case scenario, with the modelled receptors being right on the boundary fence. In reality, most waterbirds would be located towards the central and eastern portions of this field (closer to the Estuary), and would therefore be further away from the noise source. The estimated noise levels at various points across the field have therefore been examined to establish the proportion of the field that would be subject to construction noise levels in excess of ambient levels. Vibration associated with drop hammer piling is also assessed in Chapter 8: Noise and Vibration and the same approach has been applied to the assessment of effects on birds.
- 10.6.19 In the centre of field 37, noise from the piling activities is predicted to be 62 dB $L_{Aeq,1hr}$, which is still in excess of the ambient noise level. Peak noise resulting from piling is estimated to be 76 dB L_{Amax} , which is within the 'moderate adverse' disturbance threshold based on the Xodus study considered earlier in this assessment. At even the furthest receptors, estimated peak noise levels are in the range 69 – 70 dB L_{Amax} , which would be expected to also result in 'minor adverse' disturbance. For all other construction activities, noise will have attenuated to within the ambient range at this distance from the Proposed Development, and it is reasonable to conclude that the other construction activities would not result in the disturbance or displacement of waterbirds feeding, roosting and loafing in field 37.
- 10.6.20 In the absence of mitigation, it is therefore assessed that piling noise and vibration associated with construction will likely result in disturbance to birds feeding, roosting and loafing in field 37, if this takes place within the winter months when the highest aggregations of waterbirds are present in the field (September to March inclusive). This may result in displacement of birds within this field i.e. birds choose to move further away from the source of the noise but remain within the field (e.g. moving further south and east), or displacement of birds from this field entirely. This may result in increased energy expenditure as birds are spending more time flying between the mudflats and high tide roosts, and reduced feeding time as they are using more time and energy to find high tide roosting, loafing and feeding sites. This may have adverse effects on body condition and winter survival rates.

- 10.6.21 It is therefore assessed that in the absence of mitigation, the piling noise and vibration has the potential to cause moderate disturbance to waterbirds in field 37, and this is assessed as giving rise to a moderate adverse effect on the qualifying wintering bird assemblage of the Humber Estuary SPA/ Ramsar, which is significant. Mitigation is discussed in Section 10.7.

Noise/ Vibration Disturbance to Qualifying SPA/ Ramsar Wintering Bird Assemblage in Adjacent Fields to the North

- 10.6.22 Fields to the north of the Proposed Development on the north side of South Marsh Road (fields 30 and 31) have also been scoped into the noise and vibration impact assessment, because they are considered to be functionally linked to the Humber Estuary SPA/ Ramsar due to the aggregations of wintering birds they support. These fields are expected to experience typically higher ambient noise levels than those to the south, as a result of HGV and other vehicle movements along South Marsh Road and Hobson Way, which runs along the western boundary of field 30.

- 10.6.23 The central point of these two fields is approximately 400 m north-west for the nearest part of the Proposed Development. For all construction activities except the drop hammer piling, noise levels will have attenuated to within the ambient range at this distance from the works, and would therefore not be reasonably expected to displace waterbirds in fields 30 and 31. Vibration from drop hammer piling also decreases with distance from the piling location.

- 10.6.24 For drop hammer piling, the predicted noise level at the centre of the fields is 59 dB $L_{Aeq,1hr}$, which is slightly higher than the ambient noise level. Peak noise levels are estimated to be 72 dB L_{Amax} at this location, which is within the threshold for 'minor adverse' disturbance effects based on the Xodus study previously referred to in this chapter. This may result in some localised displacement of waterbirds within the field, should the piling activity overlap with the wintering period when birds are present. However, it is considered that the noise levels are not sufficiently high to result in complete displacement from the fields, particularly given that the southern and western extents of these fields (particularly field 30) are subject to relatively high ambient noise levels as a result of traffic along Hobson Way and South Marsh Road.

- 10.6.25 It is assessed that, in the absence of mitigation, piling noise and vibration has the potential to cause minor disturbance to waterbirds in fields 30 and 31, and this is assessed as giving rise to a minor adverse effect on the qualifying wintering bird assemblage of the Humber Estuary SPA/ Ramsar, which is not significant.

Visual Disturbance to Qualifying SPA/ Ramsar Wintering Bird Assemblage at Pyewipe Mudflats

- 10.6.26 Given the distance of the Proposed Development from the Pyewipe mudflats, and the fact that construction will be set against the backdrop of the adjacent SHBPS, it is reasonable to conclude that there is minimal risk of visual disturbance to waterbirds feeding, roosting or loafing within the boundary of the SPA/ Ramsar. Furthermore, the substantial flood embankment wall will provide screening of construction activities to birds present on the mudflats/ shoreline. It is assessed that the Proposed Development will not result in any visual disturbance to waterbirds within the boundary of the Humber Estuary SPA/ Ramsar.

Visual Disturbance to Qualifying Wintering Bird Assemblage in Adjacent Field to the South

- 10.6.27 The nature and scale of the construction activities associated with the Proposed Development will be set against the backdrop of the SHBPS, and will therefore not represent a significant change in the type of structures already present in habitats

adjacent to fields used by waterbirds. Regardless of this, it is difficult to predict with any degree of certainty what the response of waterbirds will be to changes in the visual environment. It is reasonable to assume that such birds are resilient to any changes that do not directly affect habitats within which they are feeding, roosting and loafing, because they are present in a dynamic and highly commercial environment associated with the busy Humber Estuary. This includes the presence of tall structures such as power stations, bulk handling facilities, jetties and cranes, and the movement of large commercial vessels in and out of the nearby ports of Immingham and Grimsby.

- 10.6.28 As a precaution, a c.2.5 m high close board fence will be installed along part of the southern boundary of the Site (see Figure 4.2 in PEI Report Volume II) during the establishment of the construction site to provide visual screening from vehicle and personnel movements to any waterbirds feeding, roosting or loafing in the field.
- 10.6.29 Visual impacts on waterbirds feeding, roosting and loafing in the field to the south are, with this mitigation in place, therefore assessed as giving rise to a neutral effect on the qualifying wintering bird assemblage of the Humber Estuary SPA/ Ramsar.

Surface Water Pollution to Habitats

- 10.6.30 The ditches within the Site boundary currently capture surface water run-off and divert it to either Oldfleet Drain (to the south of the Site) or Middle Drain (to the north of the Site), from where it is discharged into the Humber Estuary. In the absence of mitigation, there is therefore the potential for contaminated surface water run-off to enter the drainage system and ultimately the Estuary. These pathways are considered in Chapter 14: Water Resources, Flood Risk & Drainage.
- 10.6.31 However, potential pollution (with sediment or contaminants) arising from surface water run-off from within the Site during construction will be controlled through the adoption of standard best practice construction methods to meet environmental requirements. This may include temporary measures to attenuate surface water run-off (e.g. SUDS, containment lagoon or similar), the use of drip trays beneath plant and/ or bunding of fuel or oil tanks and the use of double-skinned fuel or oil tanks to minimise the risk of spillage. These measures will be detailed in the CEMP, and a pollution plan will be prepared to deal with an accidental pollution event. These are measures which are put in place as standard on similar construction projects and are not included here specifically to avoid an effect on the Humber Estuary.
- 10.6.32 It is reasonable to conclude that, with these measures in place, there is a negligible risk of surface water pollution to the Estuary during the construction phase. This is assessed as a neutral effect on the Humber Estuary SAC/ SPA/ Ramsar/ SSSI designated habitats, and the ecology features they support (waterbirds, sea lamprey, river lamprey and grey seal).

Loss of Semi-Improved Grassland During Construction

- 10.6.33 Approximately 6.7 ha of semi-improved grassland evaluated to be of District nature conservation value will be permanently lost to the Proposed Development at the start of construction. In the absence of mitigation, this is assessed to be a large impact because it will result in the irreversible loss of this habitat within the Main Development Area. This is assessed to give rise to a moderate adverse effect, which is significant.

Potential Effects on Aquatic Invertebrates During Construction

Loss of Habitat due to Culvert Construction

- 10.6.34 The Proposed Development will not directly affect Ditch 2, which had the greatest diversity of aquatic invertebrate species and was therefore evaluated to be of the

highest nature conservation value (District) of those surveyed within the Site, or Ditch 1, which was evaluated to be of Local nature conservation value.

- 10.6.35 The installation of the culvert to facilitate access to the Main Development Area from South Marsh Road will result in direct impacts on approximately 8 – 10 m of Ditch 3, which runs along the northern boundary. This is assessed to be a negligible impact on the ditch, because it will not result in any substantial or extensive damage to the ditch, and as there are already culverted sections of this ditch, it will not reasonably change the habitats or assemblage of terrestrial invertebrate species present. This is assessed as giving rise to a negligible effect on Ditch 3.

Surface Water Pollution

- 10.6.36 As discussed above in respect of potential impacts on the Humber Estuary, the adoption of best practice construction methods will minimise the risk of surface water pollution to the ditches during the construction phase. There will also be an undeveloped buffer zone established along all ditches of at least 5 m, which will protect the ditches during construction. It is therefore assessed that there will be a negligible effect on the ditches as a result of surface water pollution during construction.

Potential Effects on Schedule 1 Nesting Birds During Construction – Peregrine Falcons

Disturbance

- 10.6.37 A pair of peregrine falcons was observed around the SHBPS during several surveys undertaken in summer 2018, and it is assumed that they nested there; anecdotal evidence from the Applicant indicates that they likely nest on SHBPS most years. Given the proximity of the nesting location at SHBPS to the Main Development Area, there is the potential for disturbance to occur during the construction phase.
- 10.6.38 However peregrine falcons can be highly adapted to sites with human activity, such as the existing SHBPS. The species displays a high degree of nest-site fidelity and are likely to return to the same nesting location as in previous years. Given that this species is present in the existing industrial context of the SHBPS, it is reasonable to assume that the nesting pair would not be adversely affected by the movement of vehicles, plant and people during construction of the Proposed Development because this will be a regular occurrence on the existing SHBPS site. No disturbance impacts are therefore considered likely, and the effect is assessed as negligible and not significant

Potential Effects on Water Vole During Construction

Loss of Ditch Habitat due to Culvert Construction

- 10.6.39 There will be a direct impact on the ditch running along the northern boundary of the Site (Ditch 3), but this will be limited to the installation of a short culvert (approximately 8 – 10 m) to facilitate vehicle access to the Proposed Development from South Marsh Road. The permanent loss of habitat resulting from this part of the Proposed Development will be minimal (the total length of this ditch is around 1 km). No other ditches would be directly affected.
- 10.6.40 The minor nature of the habitat loss in Ditch 3 would not reasonably result in any loss of water vole territories, or result in fragmentation or isolation of populations because individuals would still be able to access habitats on either side of the culvert. There are existing culverts on this ditch that are clearly not barriers to the movement of water voles throughout the ditch network. This impact is assessed as giving rise to a neutral effect on water voles.

- 10.6.41 In the absence of mitigation, there is a risk that water voles may be accidentally killed or injured during the construction works, and their burrows damaged or destroyed. Mitigation for this species will therefore be implemented for legislative compliance, and the works will be undertaken under the supervision of an ecologist holding a Natural England Class Licence for water voles.

Damage to Ditch Habitat due to Construction

- 10.6.42 Embedded mitigation in the design of the Proposed Development has incorporated a 5 m undeveloped buffer zone along the banks of all perimeter ditches to prevent damage and disturbance to water vole habitats. It is therefore reasonable to assume that water vole burrows would not be damaged by construction activities.
- 10.6.43 It may be necessary to undertake minor works within the 5 m buffer zone e.g. perimeter fence installation, but any such works would not require deep excavations, and would not reasonably be expected to result in damage to water vole burrows. The ditch banks are particularly steep-sided, and no water vole burrows were identified towards the tops of the banks; burrows are therefore likely to be further down the banks around the water level.
- 10.6.44 Measures to control the risk of surface water pollution that could result in damage to the riparian habitats supporting water voles e.g. as a result of siltation or a fuel spill, will be set out in the CEMP. A number of other embedded mitigation measures to avoid surface water impacts are set out in Chapter 14: Water Resources, Flood Risk and Drainage. With these measures in place, it is reasonable to conclude that there would be a negligible risk of contamination to the surface water of the ditches during construction.

Accidental Killing or Injury

- 10.6.45 In the absence of mitigation, there is a risk that water voles may be accidentally killed or injured during the works to install the culvert in Ditch 3. Mitigation for this species will therefore be implemented for legislative compliance, and the works will be undertaken under a Natural England licence.
- 10.6.46 It is considered that the minor extent of the works, and the likely small number of individual water voles affected, mean that displacement of water voles would be undertaken under the supervision of an ecologist holding a Natural England Class Licence for water voles, rather than triggering the requirement for a development-specific licence. This is discussed in Section 10.7 Mitigation.

Noise and Visual Disturbance

- 10.6.47 There is the potential for noise/ visual disturbance to water vole during the construction phase. However, given the industrial nature of the surrounding land use which includes an operational power station (SHBPS), chemical plant (to the north) and cooling water pumping station (to the east), it is reasonable to assume that water voles resident on ditches in this area would be habituated to current operational activity. Furthermore, the 5 m buffer along all ditches would limit the potential for any disturbance to water voles. It is assessed that construction disturbance would give rise to neutral effects on water voles.

Potential Impacts on Otter During Construction

Loss of Ditch Habitat due to Culvert Construction

- 10.6.48 As discussed above in respect of water vole, the minor loss of ditch habitat resulting from culverting of a short section of Ditch 3 for site access will not result in any impacts

on otter. The culvert will not obstruct access to or fragment the ditch network, which already contains similar short culverted sections.

Noise and Visual Disturbance

10.6.49 There is the potential for noise/ visual disturbance to otter during the construction phase. This species is largely nocturnal and given that the majority of the works would be undertaken during daylight hours, it is unlikely that any otters would be present during construction activities as there is no suitable habitat cover for them to lie-up in. However, given the industrial nature of the surrounding land use which includes an operational power station (SHBPS), chemical plant (to the north) and cooling water pumping station (to the east), it is reasonable to assume that otters moving through ditches in this area would be habituated to current operational activity. It is assessed that construction activities would give rise to neutral effects on otter.

Operation

10.6.50 This section describes the impacts and potential effects during the operational and maintenance phase of the Proposed Development on relevant ecological features in the absence of any mitigation, over and above that which is inherent to the design.

10.6.51 To enable a focussed impact assessment, screening was undertaken of potential impacts of the operational phase that are likely to result in adverse or beneficial effects on relevant ecological features and that require further impact assessment. The relevant impacts are taken forward in the more detailed impact assessment that follows. Those impacts that are considered unlikely to result in significant effects are scoped out and not considered further.

10.6.52 The following potential source-receptor pathways have been scoped out of the impact assessment:

- noise/ visual disturbance to Humber Estuary SPA/ Ramsar qualifying breeding bird species (bittern, marsh harrier, avocet and little tern) - there is no suitable habitat for the qualifying species of breeding birds within the potential zone of influence of noise and visual disturbance arising from the operation of the Proposed Development. There is therefore no pathway by which these features could be affected by the Proposed Development;
- visual disturbance to qualifying Humber Estuary SPA/ Ramsar wintering bird species feeding on mudflats – the nearest mudflats are approximately 175 m from the Proposed Development, and the cooling water pumping station and substantial flood embankment and seawall lies between the mudflats and the Proposed Development. The type and scale of buildings associated with the Proposed Development are not significantly different from those already present on the SHBPS site, and therefore there would be no discernible visual change in the baseline environment; and
- air quality impacts on intertidal and subtidal habitats in the Humber Estuary SAC/ SSSI – intertidal habitats are not susceptible to the effects of changes in air quality arising from stack emissions during operation (increased nitrogen and acid deposition) because of their regular tidal inundation. Subtidal habitats have similarly been scoped out.

10.6.53 Impacts during the operational period that have potential to result in significant effects on relevant ecological features, and which were screened into the impact assessment are considered further below:

- potential effects on Humber Estuary SAC/ SPA/ Ramsar/ SSSI (changes in air quality, noise and visual disturbance and surface water pollution);

- potential effects on Local Wildlife Sites (changes in air quality);
- potential effects on aquatic invertebrates (surface water pollution);
- potential effects on Schedule 1 breeding birds (disturbance);
- potential effects on water vole (noise and visual disturbance, surface water pollution to ditches); and
- potential effects on otter (noise and visual disturbance, surface water pollution to ditches).

Potential Effects on Humber Estuary SAC/ SPA/ Ramsar/ SSSI During Operation

Air Quality Impacts on Habitats

- 10.6.54 An air quality impact assessment has been undertaken and is presented in PEI Report Chapter 7: Air Quality. The proposed stack heights are fixed at 102 m AOD to provide certainty to the assessment.
- 10.6.55 There are two measures of particular relevance when considering the potential for significant effects on habitats to result from changes in air quality arising from the Proposed Development. The first is the concentration of oxides of nitrogen (known as NO_x) in the atmosphere. The main importance is as a source of nitrogen (N), which is then deposited on adjacent habitats either directly (known as dry deposition, including directly onto the plants themselves) or washed out in rainfall (known as wet deposition). The deposited nitrogen can then have a range of effects, primarily growth stimulation or inhibition, but also biochemical and physiological effects such as changes to chlorophyll content. NO_x may also have some effects which are un-related to its role in total nitrogen intake (such as the acidity of the gas potentially affecting lipid biosynthesis) but the evidence for these effects is limited and they do not appear to occur until high annual concentrations of NO_x are reached.
- 10.6.56 The guideline atmospheric concentration of NO_x advocated by Government for the protection of vegetation is 30 micrograms per cubic metre (µgm⁻³), known as the Critical Level (Hall *et al.* 2006). This is driven by the role of NO_x in N deposition and in particular in growth stimulation and inhibition. If the total NO_x concentration in a given area is below the Critical Level, it is unlikely that N deposition will be an issue, unless there are other sources of nitrogen (e.g. ammonia). If it is above the Critical Level then local N deposition from NO_x could be an issue and should be investigated.
- 10.6.57 The second important metric is a direct determination of the rate of the resulting N deposition, which is habitat specific because different habitats have varying tolerance to nitrogen. For many habitats there are measurable effects in the form of published dose-response relationships for N deposition, which do not exist for NO_x. Unlike NO_x, the N deposition rate below which current evidence suggests that effects should not arise is different for each habitat. The rate (known as the Critical Load) is provided on the UK Air Pollution Information System website (www.apis.ac.uk) and is expressed as a quantity (kilograms) of nitrogen over a given area (hectare) per year (kg N/ha/yr). More recently, there has also been research compiled that investigates N dose-response relationships in a range of habitats (Caporn *et al.* 2016).
- 10.6.58 For completeness, rates of acid deposition were also calculated. Acid deposition derives from both sulphur and nitrogen. It is expressed in terms of kiloequivalents (keq) per hectare per year. The thresholds against which acid deposition is assessed are referred to as the Critical Load Function.

- 10.6.59 The effects of elevated Hydrogen Fluoride (HF) emissions have been discounted from the assessment for ecological receptors on the basis that habitats are not sensitive to this type of pollutant.

Nitrogen Oxides (NO_x)

- 10.6.60 The air quality impact assessment has modelled a number of receptors within the Humber Estuary SAC/ SPA/ Ramsar/ SSSI that are sensitive to NO_x emissions. The nearest to the Proposed Development is an area of saltmarsh habitat approximately 400 m south-east (receptors E1_1, E1_2 and E1_3 in Chapter 7: Air Quality). At these receptors, the process contribution resulting from the maximum annual mean NO_x emissions is 2.4%, 2.4% and 2.5% respectively of the Critical Level for the Humber Estuary SAC/ SPA/ Ramsar. This therefore exceeds the screening threshold at which an adverse effect on the designated habitats (and therefore the species they support) may occur, and indicates that further assessment is required.
- 10.6.61 At this location, APIS data indicate that the background annual mean NO_x concentration at these receptors is 29.2 µg/m³. The process contribution from the Proposed Development, although greater than 1%, results in total NO_x of 29.9 µg/m³, which does not exceed the Critical Level for all vegetation types from the effects of NO_x of 30 µg/m³. As most of the reported concentration of NO_x is due to the published background value used in the calculations, further analysis was undertaken using project-specific survey data, which concluded that the annual mean NO_x process contribution would be 2.5% of the Critical Level, resulting in total annual mean NO_x concentration of 18.7 µg/m³.

Nutrient Nitrogen (N) Deposition

- 10.6.62 The air quality impact assessment has concluded that the annual N deposition rate (kg N/Ha/year) process contribution at the nearest saltmarsh habitat would be 2.1% of the Critical Load at receptors E1_1, E1_2 and E1_3. As this is above the 1% screening threshold, it is therefore necessary to examine the output from the modelling in greater detail to establish whether this elevation in N deposition would result in any significant effects on the saltmarsh habitat.
- 10.6.63 The total annual N deposition predicted at these three receptors is 0.4 kg N/ha/yr, resulting from NO_x and ammonia (NH₃), compared to the background deposition of 15.7 kg N/ha/yr. With the Proposed Development there would therefore be no exceedance of the Critical Load for this habitat type, which is 20 – 30 kg N/ha/yr. It is therefore assessed that N deposition resulting from the Proposed Development will result in a neutral effect on the Humber Estuary SPA/ SAC/ Ramsar/ SSSI that is not significant.

Acid Deposition

- 10.6.64 For acid deposition (keq/Ha/year), the air quality impact assessment identified that there would be no exceedances of the 1% Critical Level screening threshold for potential adverse effects on sensitive habitat types within the Humber Estuary SAC/ SPA/ Ramsar/ SSSI. It is therefore concluded that there would be no significant effects on the Humber Estuary designated site as a result of acid deposition.

Sulphur Dioxide (SO₂)

- 10.6.65 For sulphur dioxide, the air quality impact assessment identified that there would be no exceedances of the 1% Critical Level screening threshold for potential adverse effects on sensitive habitat types within the Humber Estuary SAC/ SPA/ Ramsar/ SSSI. It is therefore concluded that there would be no significant effects on the Humber Estuary designated site as a result of SO₂ emissions from the Proposed Development.

Air Quality Impacts on Habitats (Cumulative)

10.6.66 A cumulative air quality impact assessment has been undertaken and a summary is presented in Chapter 17: Cumulative and Combined Effects.

Surface Water Pollution to Habitats Supporting Marine Species

10.6.67 Potential pollution (sediment or contaminants) arising from surface water run-off from within the Site during operation will be controlled through the drainage design. This is set out in Chapter 13: Surface Water, Flood Risk and Drainage (PEI Report Volume I).

10.6.68 There is therefore no surface water pathway by which the Proposed Development could impact on the Humber Estuary SAC/ SPA/ Ramsar/ SSSI designated habitats, and the marine ecology features they support (sea lamprey, river lamprey and grey seal).

Noise Disturbance to Qualifying SPA/ Ramsar Wintering Bird Assemblage at Pyewipe Mudflats

10.6.69 Predicted operational noise levels at receptor R3 (at the edge of the Humber Estuary SPA/ Ramsar boundary) are 5 dB below the ambient noise level of 52 dB L_{Aeq} during the worst case hour at night (06:00 – 07:00). This results in an increase in the ambient level at receptor R3 of no more than 1 dB, which is not significant.

10.6.70 With regards to L_{AFmax} levels during operation of the Proposed Development, it is not expected that significant L_{AFmax} events will occur at the Site which will be audible along the Humber Estuary. The activities that are likely to result in the highest L_{AFmax} levels are the tipping of waste into the bunker when it is delivered and the placing of waste into the shredder. As these activities are undertaken within the enclosed fuel reception hall and fuel bunker parts of the building, which are located at the furthest point of the building from the Estuary, L_{AFmax} levels from these activities are unlikely to be audible at the Estuary.

10.6.71 It is assessed that operational noise arising from the Proposed Development will result in a neutral effect on waterbirds feeding, roosting and loafing in the Pyewipe mudflats.

10.6.72 Noise associated with abnormal operational activities, such as maintenance or operation of boiler safety valves or steam turbine bypass valves, has not been specifically modelled as part of the noise assessment presented in Chapter 8: Noise and Vibration, but noise from such activities are expected to be lower than construction noise effects, which are assessed in paragraphs 10.6.8 to 10.6.25 above,

Noise Disturbance to Qualifying SPA/ Ramsar Wintering Bird Assemblage in Adjacent Fields to North

10.6.73 At the nearest part of the northern fields to the Proposed Development operational noise is predicted to be up to 68 dB L_{Aeq} , which is above the ambient level for the 'worst case hour' between 06:00 and 07:00 (see Chapter 8: Noise and Vibration and the noise contours are shown on Figure 8.2 in PEI Report Volume II). However, as discussed above in respect of the assessment for construction noise, it is reasonable to assume that waterbirds using these fields would not be using habitats close to boundary features (due to the requirement for scanning distances for predator avoidance), and are therefore more likely to be orientated towards the middle of the fields. In the centre of fields 30 and 31, operational noise levels will have attenuated with distance to around 50 dB L_{Aeq} , which is similar to ambient levels. No displacement of waterbirds would therefore be anticipated.

10.6.74 Noise associated with the operation of the Proposed Development is therefore assessed as giving rise to a neutral effect on the qualifying wintering bird assemblage of

the Humber Estuary SPA/ Ramsar using the functionally linked fields to north (fields 30 and 31).

Noise Disturbance to Qualifying SPA/ Ramsar Wintering Bird Assemblage in Adjacent Field to South

10.6.75 At the nearest part of the southern field to the Proposed Development, operational noise is predicted to be up to 62 dB L_{Aeq} , which is above the ambient level. However, as discussed above in respect of the assessment for construction noise, it is reasonable to assume that waterbirds using the fields would not be using habitats close to boundary features (due to the requirement for scanning distances for predator avoidance), and are therefore more likely to be orientated towards the middle of the field. Towards the centre of field 37, operational noise levels will have attenuated to around 50 dB L_{Aeq} , which is similar to ambient levels. No displacement of waterbirds would therefore be anticipated.

10.6.76 Noise associated with the operation of the Proposed Development is therefore assessed as giving rise to a neutral effect on the qualifying wintering bird assemblage of the Humber Estuary SPA/ Ramsar using the functionally linked field to the south (field 37).

Visual Disturbance to Qualifying Wintering Bird Assemblage in Adjacent Field to the South

10.6.77 The nature and scale of the operational activities associated with the Proposed Development will be set against the backdrop of the SHBPS, and will therefore not represent a significant change in the type of structures already present in habitats adjacent to fields used by waterbirds. Regardless of this, it is difficult to predict with any degree of certainty what the response of waterbirds will be to changes in the visual environment. It is reasonable to assume that such birds are resilient to any changes that do not directly affect habitats within which they are feeding, roosting and loafing, because they are present in a dynamic and highly commercial environment associated with the busy Humber Estuary. This includes the presence of tall structures such as power stations, bulk handling facilities, jetties and cranes, and the movement of large commercial vessels in and out of the nearby ports of Immingham and Grimsby.

10.6.78 It is therefore reasonable to assume that any SPA/ Ramsar waterbirds roosting/ loafing/ foraging in field to the south of the Site are habituated to the industrial nature of the surrounding area such that they would not be disturbed by the presence of tall chimney structures and other buildings on adjacent land. As a general precaution the c.2.5 m high close-boarded fence along the southern border of the Site will be retained for the operational lifespan of the Proposed Development to reduce potential visual disturbance on wintering birds from ground level activities (operational traffic and staff). Visual impacts on waterbirds feeding, roosting and loafing in the adjacent field to the south are therefore assessed as giving rise to a neutral effect on the qualifying wintering bird assemblage of the Humber Estuary SPA/ Ramsar.

Potential Impacts on Local Wildlife Sites During Operation

Air Quality Impacts

10.6.79 The air quality impact assessment in Chapter 7: Air Quality has considered potential air quality impacts arising from emissions of pollutants from the Proposed Development on the non-statutory sites identified within 2 km of the Site, although there are no baseline data for these sites as there are for the statutory designated sites because they are not included on the APIS database. Various assumptions on the habitat types have therefore been made to inform the modelling process.

10.6.80 Of the local sites considered in the modelling, Stallingborough Fish Ponds LWS (E7), Healing Cress Beds LWS (E8) and Sweedale Croft Drain (E9) will be subject to cumulative Process Contributions (PCs) of NO_x from all plans/ projects above the 1% screening threshold. When the Predicted Environmental Concentrations (PECs) for NO_x at these three LWSs are examined in greater detail, at all three sites this results in an exceedance of the Critical Level. The cumulative N deposition PC will be 0.2 – 0.5 kg N/ha/yr and the total PEC will be 15.9 to 25 kg N/ha/yr. The contribution from the Proposed Development alone is 0.1 to 0.3 kg N/ha/yr, which is a relatively small increase in N deposition (i.e. less than 5% of the Critical Load). When considering high background deposition rates, this is assessed as a minor adverse effect on the LWSs that is not significant.

Potential Effects on Aquatic Invertebrates During Operation

Surface Water Pollution

10.6.81 Embedded mitigation in the drainage design to control surface water run-off during operation will ensure that there is negligible potential for any pollution to habitats that may be used by water vole. Similarly, discharge will be attenuated on site to greenfield run-off rates, and therefore there is no potential for any impacts on the water levels within the ditch. No impacts on ditch habitats or the aquatic invertebrates they support are predicted as a result of the operation of the Proposed Development.

Potential Effects on Schedule 1 Nesting Birds During Operation – Peregrine Falcon

Disturbance

10.6.82 During operation it is expected that disturbance levels, with respect to peregrine falcon, will return to the original baseline of disturbance from SHBPS, where the species has chosen to nest. It is likely that peregrine falcons will become habituated to the operational Proposed Development, as currently observed at SHBPS. It is therefore assessed that operational activities will give rise to neutral effects upon peregrine falcon.

Potential Impacts on Water Vole During Operation

Noise and Visual Disturbance

10.6.83 There is the potential for noise/ visual disturbance to water vole during the operational phase. However, given the industrial nature of the surrounding land use which includes an operational power station (SHBPS), chemical plant (to the north) and cooling water pumping station (to the east), it is reasonable to assume that water voles resident on ditches in this area would be habituated to current operational activity. The 5 m undeveloped buffer zone will also minimise the risk of disturbance to water voles. It is assessed that operational activities would give rise to neutral effects on water voles.

Surface Water Pollution to Ditches

10.6.84 Embedded mitigation in the drainage design to control surface water run-off during operation will ensure that there is negligible potential for any pollution to habitats that may be used by water vole. Similarly, discharge will be attenuated on site to greenfield run-off rates, and therefore there is no potential for any impacts on the water levels within the ditch.

Potential Impacts on Otter During Operation

Noise and Visual Disturbance

10.6.85 There is the potential for noise/ visual disturbance to otter during the operational phase. As discussed above in respect of water vole, given the industrial nature of the

surrounding land use which includes an operational power station (SHBPS), chemical plant (to the north) and cooling water pumping station (to the east), it is reasonable to assume that otters moving through ditches in this area would be habituated to current operational activity. It is assessed that operational activities would give rise to neutral effects on otter.

Surface Water Pollution to Ditches

- 10.6.86 Embedded mitigation in the drainage design to control surface water run-off during operation will ensure that there is negligible potential for any pollution to habitats that may be used by foraging/ passage otter. Similarly, discharge will be attenuated on site to greenfield run-off rates, and therefore there is no potential for any impacts on the water levels within the ditch.

Decommissioning

- 10.6.87 In a number of cases impacts associated with the decommissioning phase of the Proposed Development are likely to be of a similar nature to those associated with the construction phase, because no further habitat loss will be caused and the decommissioning methodology will be of a similar impact level to that of construction in terms of noise, vibration, and air quality. As a result the potential effects on ecological features are not anticipated to differ significantly from those predicted at construction.
- 10.6.88 The extent of habitat loss that is likely to be required during decommissioning is likely to be much less than at construction (i.e. no further habitat loss), and the resulting effects on ecological features are therefore likely to be reduced. As described in Section 10.9, appropriate pre-works surveys and mitigation or impact avoidance measures will be implemented for the decommissioning phase as necessary.

Comparison of Proposed Development and Consented Development

- 10.6.89 The impacts and effects of the whole of the Proposed Development compared to a future baseline with the whole of the Consented Development are described below.

Construction

- 10.6.90 Using the Rochdale Envelope approach, the EclA for the Consented Development assumed that the whole of the Main Development Area would be cleared during the construction of the Consented Development. There would therefore be no additional loss of semi-improved grassland habitat within the Main Development Area (which is also functionally linked SPA water bird habitat) due to the Proposed Development.
- 10.6.91 The predicted noise/ vibration and visual disturbance impacts from construction of the Consented Development experienced at Pyewipe mudflats and fields used by SPA water birds to the north and south of the Main Development Area would be the same as the construction noise impacts predicted due to the Proposed Development, because the nature and duration of construction activities would be the same and the footprint of development would be very similar (see Figure 4.3 in PEI Report Volume II). There would therefore be no additional construction noise/ vibration or visual disturbance effects on Pyewipe mudflats, or fields to the north and south of the Main Development Area due to the construction of the Proposed Development.
- 10.6.92 As the nature and duration of construction activities, including good practice methods to control pollution, will be implemented for the Proposed Development as for the Consented Development, the construction of the Proposed Development would have no additional effects on habitats due to surface water pollution.
- 10.6.93 The ditch culvert required to create the access into the Main Development Area would be the same for the Consented Development or the Proposed Development, so the

Proposed Development would have no additional effects on the ditch (terrestrial invertebrate assemblage or water voles) compared to the Consented Development. The culvert construction work will be undertaken under the supervision of an ecologist holding a Natural England Class Licence for water voles.

- 10.6.94 A 5 m buffer zone would be maintained along the banks of all ditches around the Main Development Area during the construction of either the Consented Development or the Proposed Development, so the Proposed Development would avoid effects on water vole in the same way as the Consented Development.

Operation

- 10.6.95 As set out in Chapter 7: Air Quality, the operational air emissions from the Proposed Development would be the same as the operational air emissions from the Consented Development, as the same amount of fuel would be combusted using the same methods. Air quality effects on habitats and designated sites due to the operation of the Proposed Development would be the same as the effects of the Consented Development's operation.
- 10.6.96 The noise and vibration impacts from the operation of the Proposed Development at the nearest sensitive ecological receptors (Pyewipe mudflats, and fields to the north and south of the Main Development that are used by water birds) would be the same as the noise and vibration impacts on these receptors from the operation of the Consented Development, because the nature of the operation and operational traffic flows would be the same, and the scale and layout of the operational development would be very similar. Similarly, visual disturbance of water birds using the fields to the south of the Main Development Area would also be the same for either the Consented Development or the Proposed Development, and a 2.5 m visual screen would be provided as part of either development.
- 10.6.97 The operation of the Proposed Development would cause no additional disturbance of water voles or otter using ditches around the Site compared to the operation of the Consented Development (the effect for either development is assessed to be neutral).
- 10.6.98 The Proposed Development would also introduce no additional surface water pollution impacts on habitats compared to the Consented Development, as appropriate drainage and pollution control measures will be implemented for either development.

Decommissioning

- 10.6.99 The scale and nature of the Proposed Development is so similar to the Consented Development that the decommissioning effects on ecological receptors would be the same for either development. Appropriate surveys would be undertaken prior to decommissioning to ensure any necessary mitigation or impact avoidance measures are identified and implemented.

10.7 Mitigation and Enhancement Measures

Humber Estuary SPA/ Ramsar Mitigation

Piling Noise and Vibration Mitigation

- 10.7.1 The assessment has concluded that there is the potential for significant adverse effects on waterbirds in the adjacent field to the south (field 37), which is functionally linked to the Humber Estuary SPA/ Ramsar, as a result of piling noise and vibration during construction. Although the piling activity will only be undertaken for a relatively short period of time (estimated at 2 to 4 months), it is not possible at this stage to determine whether this will overlap with the sensitive wintering bird period. It may therefore occur when birds are present and they could be disturbed or displaced.

10.7.2 At this stage, the mitigation measures to be employed have not been fixed; this is to enable sufficient flexibility for the contractor to determine the best available technique for noise abatement during piling works. For the purposes of this EclA, it is assumed that mitigation will be one of the following options:

- seasonal piling restrictions – piling will be restricted for two hours either side of high tide in the period September to March inclusive, to avoid the most sensitive winter months, and the time period when birds are most likely to be present in the fields (i.e. when they are pushed off the coastal mudflats at high tide); or
- Continuous Flight Auger (CFA) piling – this technique is virtually vibration free, and one of the quietest forms of piling because it does not require the loud ‘bangs’ associated with drop hammer piling techniques. If this technique is adopted, it will be possible to reduce construction noise reaching the fields to within ambient levels, and vibration disturbance effects would also be reduced.

Construction Environmental Management Plan

10.7.3 The Construction Environmental Management Plan (CEMP) (see Framework CEMP at Appendix 5A in PEI Report Volume III) will include details of ecological impact avoidance and mitigation measures to be implemented during the construction phase, including:

- water vole mitigation;
- grass snake mitigation; and
- breeding bird mitigation.

10.7.4 The mitigation requirements are described further in paragraphs 10.7.7 to 10.7.13 below.

Ecological Management and Enhancement Plan (EMEP)

10.7.5 An EMEP will be prepared and agreed in accordance with a Development Consent Order requirement. An area of land approximately 1 ha in extent has been set aside within the Site for ecological mitigation and biodiversity enhancements to the west of the SHBPS as an ‘ecological mitigation and enhancement area’ (see Figure 4.2).

10.7.6 The EMEP will include details on:

- grassland mitigation (location and detailed planting specification);
- new pond creation (including detailed pond design, location and planting specification);
- the location and construction specifications for log pile refuges and bird nest boxes;
- appropriate management of the habitats including the newly created grassland and new pond;
- habitat monitoring (including targets and thresholds for remedial action); and
- timetables and responsibilities for undertaking the above tasks.

Water Vole Mitigation

10.7.7 Works to install the culvert on Ditch 3 will be undertaken under the supervision of an ecologist holding a Class Licence for water vole. This is due to the minor extent of the works (approximately 8 – 10m) that does not trigger the requirement for a development licence from Natural England. A separate water vole mitigation strategy document will

be prepared as part of the Class Licence process; however, the approach and timings are outlined below.

10.7.8 The approach to mitigation will be as follows:

- ditch vegetation (within the channel and on the banks) will be strimmed back to ground level under the supervision of the Class Licensed ecologist to displace water voles from the affected section of habitat in the period 15th February to 15th April;
- ditch vegetation will be kept strimmed short until works commence;
- arisings will be removed;
- prior to the commencement of works, the Class Licensed ecologist will inspect the working area to confirm that water voles were absent from any burrows present;
- on confirmation of the absence of water voles, works to install the culvert will commence under the supervision of the Class Licensed ecologist; and
- any amphibians encountered during the works will be moved to a place of safety away from the working area.

10.7.9 This mitigation approach will also be sufficient to address the risk of accidental killing/injury to water shrew (*Neomys fodiens*), which may be present in the perimeter ditches see Appendix 10E: Otter and Water Vole Survey Report in PEI Report Volume III. .

10.7.10 Any amphibians (e.g. common toad) encountered during the works will be moved to a place of safety (likely to be in close proximity to a nearby ditch) by the supervising ecologist.

Grass Snake Mitigation

10.7.11 Due to the potential for grass snake to occur on the banks of ditches, a precautionary approach to the clearance of vegetation will be undertaken (alongside the mitigation for water vole). The strimming of vegetation from the banks of Ditch 3 for water vole displacement will also be sufficient to displace grass snake.

Breeding Bird Mitigation

10.7.12 The removal of the marginal vegetation from the affected sections of ditch will be timed to ensure that there is no risk of breeding birds nesting in the vegetation prior to works commencing.

10.7.13 Grassland and marginal ditch vegetation will be removed outside the breeding bird season wherever possible. If this is not possible and vegetation removal is required during the breeding bird season, then a pre-works check for nests will be undertaken and appropriate mitigation will be implemented to avoid disturbance.

Grassland Mitigation

10.7.14 An area of species-rich grassland will be created in the ecological mitigation and enhancement area, which will be established to the west of the SHBPS. This will offset some of the losses of semi-improved grassland within the footprint of the Main Development Area. Creation and management of the habitat will be set out in the EMEP (see above).

10.7.15 The initial post-completion and establishment period will be for five years, and the grassland will be monitored once every other year (commencing one year after planting) to determine whether any management intervention is required (e.g. targeted weed removal, greater frequency of mowing etc.).

- 10.7.16 Areas of rough grassland will be created within this area with a litter layer to encourage small mammals for bird of prey foraging.

Pond Creation

- 10.7.17 Two man-made ponds were present within the Main Development Area until summer 2019, when they were drained down and infilled. Creation of a new wildlife pond has therefore been included in the habitat creation proposals for both the Consented Development and the Proposed Development.
- 10.7.18 The new pond will be created in habitat west of the existing SHBPS, where it will remain in close proximity to the perimeter ditches so that it is accessible by foraging water voles resident in the ditches.
- 10.7.19 The pond will be designed with a non-uniform margin and varying depths to maximise the habitat niches available for aquatic plants, invertebrates, reptiles and amphibians.
- 10.7.20 The margins of the pond will be planted with a small amount of native aquatic and marginal plant species to assist with the establishment of vegetation, but will be primarily allowed to establish naturally.
- 10.7.21 An appropriate management plan for the new pond will be developed and implemented post-completion of the pond. This will be incorporated within the EMEP (see above). The initial post-completion and establishment period will be for five years, and the pond will be monitored annually in September during this period to determine whether any management intervention (e.g. targeted reed clearance to maintain open water, removal of leaf litter etc.).

Biodiversity Enhancement

- 10.7.22 Biodiversity enhancement measures will be set out in the EMEP, and will be in addition to the mitigation measures set out above. The following habitat enhancements will be delivered:
- creation of log pile refuges in the ecological mitigation and enhancement area to create ecological niches for reptiles, amphibians and terrestrial invertebrates; and
 - installation of bird nest boxes on mature trees to the west of the SHBPS.

10.8 Limitations or Difficulties

- 10.8.1 Any limitations to the collection of field survey data are identified in the relevant technical appendices.
- 10.8.2 No significant limitations to the completion of this initial ecological impact assessment were identified.

10.9 Residual Effects and Conclusions

Construction

- 10.9.1 Where effects on ecology features scoped into the EclA were assessed as significant before mitigation, and/ or mitigation has subsequently been proposed in Section 10.7 above to reduce the magnitude of impacts, the residual effects have been assessed below.

Residual Effects on Humber Estuary SAC/ SPA/ Ramsar/ SSSI

Air Quality

- 10.9.2 The initial EclA predicts that the Proposed Development will give rise to no residual significant adverse air quality effects on sensitive habitats within the Humber Estuary SPA/ SAC/ Ramsar/ SSSI.

Noise/ Vibration Disturbance

- 10.9.3 No residual significant adverse effects on waterbirds feeding, roosting and loafing on Pyewipe mudflats within the Humber Estuary SPA/ Ramsar are predicted given the distance of the construction works from the mudflats, and the noise screening provided by the substantial flood defence embankment.
- 10.9.4 With mitigation, piling noise and vibration during construction will be reduced to within ambient levels (e.g. through seasonal restrictions or the use of CFA piling) in the field to the south of the Proposed Development that is considered to be also functionally linked to the Humber Estuary SPA/ Ramsar. Residual effects on waterbirds in this field, and thus the Humber Estuary, are therefore predicted to be minor adverse and not significant.

Surface Water Pollution

- 10.9.5 Embedded mitigation during construction will minimise the risk of pollution to the surrounding ditch network, and residual effects on the Humber Estuary are therefore assessed as neutral and not significant.

Residual Effects on Semi-Improved Grassland

- 10.9.6 Approximately 1 ha of species-rich grassland will be created and managed in the ecological mitigation and enhancement area to the west of the SHBPS, to mitigate for losses of this habitat within the Main Development Area. The area will be planted with a species-rich wildflower/ grassland seed mix and will aim to improve the biodiversity of the grassland habitat within the Site, and be of higher ecological value than the area of semi-improved grassland habitat lost to the Proposed Development.
- 10.9.7 Although mitigation for the loss of grassland habitat will be delivered, there is insufficient space within the Site boundary for like-for-like replacement. There will therefore be a net loss of this habitat within Site, although the creation and management of a more species-rich grassland than that lost will partially offset any impacts on the overall biodiversity of the Site. The residual effect on grassland habitats is therefore predicted to be minor adverse and not significant.

Residual Effects on Water Vole

- 10.9.8 The majority of water vole habitats identified on the Site are outside the Main Development Area boundary and will therefore not be directly affected. Embedded mitigation to control surface water run-off will ensure that the ditch habitats are not damaged during construction works.
- 10.9.9 Mitigation to address the low risk of killing/ injury during works to install a culvert on Ditch 3 will provide legislative compliance for this species in respect of the Wildlife and Countryside Act 1981. No significant residual effects on water vole are therefore anticipated.

Operation

- 10.9.10 No significant effects on ecology features have been predicated within this initial EcIA, and therefore it is concluded that the Proposed Development will not give rise to any significant adverse operational effects on ecology features including the Humber Estuary SAC/ SPA/ Ramsar/ SSSI.

Conclusions

- 10.9.11 The loss of functionally linked habitat to the Humber Estuary SPA/ Ramsar within the footprint of the Proposed Development will be addressed through the adoption of Policy 9 of the Local Plan to deliver alternative habitat for feeding, roosting and loafing birds

via the SHG strategic mitigation pathway. The Cress Marsh habitat mitigation site has been completed and NELC has confirmed that it is attracting the target bird species.

- 10.9.12 Embedded mitigation to control surface water pollution during construction and operation means that there will be no adverse effects on the coastal and marine habitats of the Humber Estuary SAC/ SPA/ Ramsar/ SSSI. Mitigation for noise/ vibration and visual effects during construction will be employed to ensure that there is no disturbance to waterbirds in adjacent fields that are functionally linked to the Humber SPA/ Ramsar. A report to inform HRA for the Proposed Development has therefore concluded that there will be no adverse effects on the integrity of the Humber Estuary SAC/ SPA/ Ramsar (see Appendix 10G in PEI Report Volume III).
- 10.9.13 Habitats within the Main Development Area were found to support breeding birds, water vole and otter, and were assumed to support grass snake due to the suitability of the habitat. Mitigation for these species will be employed during construction to avoid killing/ injury and to ensure legislative compliance in respect of the Wildlife and Countryside Act 1981. This initial assessment has therefore predicted that there will be no significant residual adverse effects on these species.
- 10.9.14 The loss of semi-improved grassland within the Main Development Area will be mitigated through the delivery of replacement, higher quality, habitats in the ecological mitigation and enhancement area to the west of the SHBPS. No significant residual adverse effects on habitats as a result of the Proposed Development are therefore anticipated.

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11.0 LANDSCAPE AND VISUAL AMENITY

11.1 Introduction

- 11.1.1 This chapter of the Preliminary Environmental Information (PEI) Report addresses the potential effects of construction, operation (including maintenance) and decommissioning of the Proposed Development on landscape character (the effects on the landscape as a resource in its own right) and visual amenity (effects on specific views and on the general visual amenity experienced by people).
- 11.1.2 This chapter is supported by Figures 11.1-11.19 provided in PEI Report Volume II and Appendices 11A and 11B in PEI Report Volume III.

11.2 Legislation and Planning Policy Context

- 11.2.1 The landscape and visual impact assessment takes account of the legislation relevant to landscape and visual issues, including the European Landscape Convention.

National Policy Statements

- 11.2.2 The Overarching National Policy Statement (NPS) for Energy EN-1 (Department for Energy and Climate Change (DECC), 2011a) includes a number of statements pertinent to the potential landscape, including green infrastructure (GI), and visual impacts of energy infrastructure in general.
- 11.2.3 Section 5.9 of NPS EN-1 sets out the requirements for assessing and mitigating landscape and visual impacts of proposed nationally significant energy infrastructure projects. The scope of the assessment should include construction phase effects as well as the effects of the completed facility and its operation on landscape components, landscape character and views and visual amenity.
- 11.2.4 In terms of mitigation, EN-1 encourages the reduction in scale of the buildings taking into consideration function, appropriate siting, design including colours and materials, and landscaping schemes to mitigate adverse landscape and visual impacts.
- 11.2.5 Paragraph 5.9.15 to 5.9.16 states
- “The scale of such projects means that they will often be visible within many miles of the site of the proposed infrastructure. The IPC [now Secretary of State] should judge whether any adverse impact on the landscape would be so damaging that it is not offset by the benefits (including need) of the project.*
- In reaching a judgment, the IPC should consider whether any adverse impact is temporary, such as during construction, and/or whether any adverse impact on the landscape will be capable of being reversed in a timescale that the IPC considers reasonable.”*
- 11.2.6 Paragraph 5.9.18 states *“All proposed energy infrastructure is likely to have visual effects for many receptors around proposed sites. The IPC will have to judge whether the visual effects on sensitive receptors, such as local residents, and other receptors, such as visitors to the local area, outweigh the benefits of the project.”*
- 11.2.7 Paragraph 5.9.22 states *“Within a defined site, adverse landscape and visual effects may be minimised through appropriate siting of infrastructure within that site, design including colours and materials, and landscaping schemes, depending on the size and type of the proposed project. Materials and designs of buildings should always be given careful consideration.”*

- 11.2.8 Section 5.10 of EN-1 establishes the requirements for identifying and mitigating impacts of energy infrastructure projects on open space (including GI).
- 11.2.9 An energy infrastructure project will have direct effects on the existing use of the proposed site and may have indirect effects on the use, or planned use, of land in the vicinity for other types of development. Given the likely locations of energy infrastructure projects there may be particular effects on open space including GI.
- 11.2.10 Where GI is affected, the Planning Inspectorate should consider imposing requirements to ensure the connectivity of the GI network is maintained in the vicinity of the development and that any necessary works are undertaken, where possible, to mitigate any adverse impact.

The National Planning Policy Framework 2019

- 11.2.11 The Ministry of Housing, Communities and Local Government published a revised National Planning Policy Framework (NPPF) in 2019. The NPPF includes policies that ensure developments are *“sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change.”*
- 11.2.12 Policy 15: Conserving and enhancing the natural environment recognises that the environment should be enhanced by:
- *“protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);*
 - *recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;*
 - *maintaining the character of the undeveloped coast, while improving public access to it where appropriate;*
 - *minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;*
 - *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and*
 - *remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate”.*

Local Planning Policy

- 11.2.13 The North East Lincolnshire Local Plan 2013 to 2032 (North East Lincolnshire Council (NELC), adopted March 2018) has been considered as part of the landscape and visual impact assessment process. The following policies from the Local Plan are relevant to the landscape setting of the Proposed Development:
- SO6 – Built, historic and natural environment;
 - SO9 – Design;
 - Policy 40 - Developing a green infrastructure network; and

- Policy 42 – Landscape.

11.3 Assessment Methodology and Significance Criteria

- 11.3.1 The landscape and visual impact assessment has been based on best practice guidance provided by the Guidelines for Landscape and Visual Impact Assessment, Third Edition (Landscape Institute and Institute of Environmental Management and Assessment (IEMA), 2013).
- 11.3.2 Baseline data has been gathered from a study of Ordnance Survey (OS) maps, aerial photography, site visits, publicly available documents (including landscape character assessments from local authorities) and national character mapping available from Natural England.
- 11.3.3 A detailed description of the assessment methodology is presented within Appendix 11A in PEI Report Volume III and is summarised below.

Assessment Scenarios

- 11.3.4 As described in Chapter 2: Assessment Methodology, for the purposes of comparison and in order to establish a 'control' scenario against which the effects of the Proposed Development may be assessed, the baseline conditions are projected forward to produce a future 'without development' (baseline) scenario. The potential impacts of the Proposed Development upon the baseline landscape and receptor views have then been identified and any resulting effects assessed and classified. The impacts and effects of the Proposed Development are considered in isolation and also in comparison to the Consented Development.
- 11.3.5 Potential landscape and visual impacts and the resulting effects (both adverse and beneficial) have been considered for the following scenarios:
- construction;
 - operation (including maintenance); and
 - decommissioning.
- 11.3.6 As described in Chapter 4: The Proposed Development and Chapter 5: Construction Programme and Management, there are a three possible construction programme scenarios. For the purposes of the landscape and visual impact assessment there is no significant difference between the three scenarios, so the construction assessment presented in this Chapter would apply to any of the scenarios.
- 11.3.7 Effects may be temporary, permanent, short-term or long-term. Landscape and visual effects may be further categorised as being either direct, i.e. originating from the Proposed Development or indirect within the Zone of Theoretical Visibility (ZTV), e.g. off-site visual impact of construction traffic.

Landscape Impact Assessment Methodology

- 11.3.8 In assessing and classifying the predicted effects from any likely impacts to the landscape resulting from the Proposed Development, the following criteria have been considered:
- landscape character;
 - landscape sensitivity; and
 - magnitude of likely impacts that may affect the landscape.
- 11.3.9 Landscape impacts have also been considered, including both the direct and indirect impacts of the Proposed Development upon landscape elements and features (or

components), as well as the impact upon the general landscape character of the surrounding area.

- 11.3.10 The relationship between sensitivity and magnitude of impact allows an assessment of the relative significance of predicted landscape effects to be made. The sensitivity of the landscape to change is the degree to which a particular Landscape Character Area (LCA) or feature can accommodate changes or new features, without unacceptable detrimental effects to its key characteristics.
- 11.3.11 The magnitude of a predicted landscape impact relates to the size, extent or degree of change likely to be experienced as a result of the Proposed Development. The magnitude takes into account whether there is a direct impact resulting in the loss of landscape components, or a change beyond the land-take of the Proposed Development that might have an effect on the character of the area, and whether the impact is permanent or temporary.
- 11.3.12 Table 11.1 below (derived from Figure 6.3 page 61, IEMA, 2011) comprises the chart used to give an approximation as to how sensitivity and magnitude can be considered together as well as professional judgement, to determine whether an effect is significant or not. For the purposes of the landscape and visual assessment, moderate and major impacts have been deemed 'significant'. Minor and negligible impacts are considered to be 'not significant'. Where significant environmental effects are identified, measures to mitigate these effects are proposed (where feasible) and remaining residual effects are identified.
- 11.3.13 A full explanation of the criteria used to assess sensitivity, magnitude of impact and classification of landscape and visual effects is presented within Appendix 11A of PEI Report Volume III.

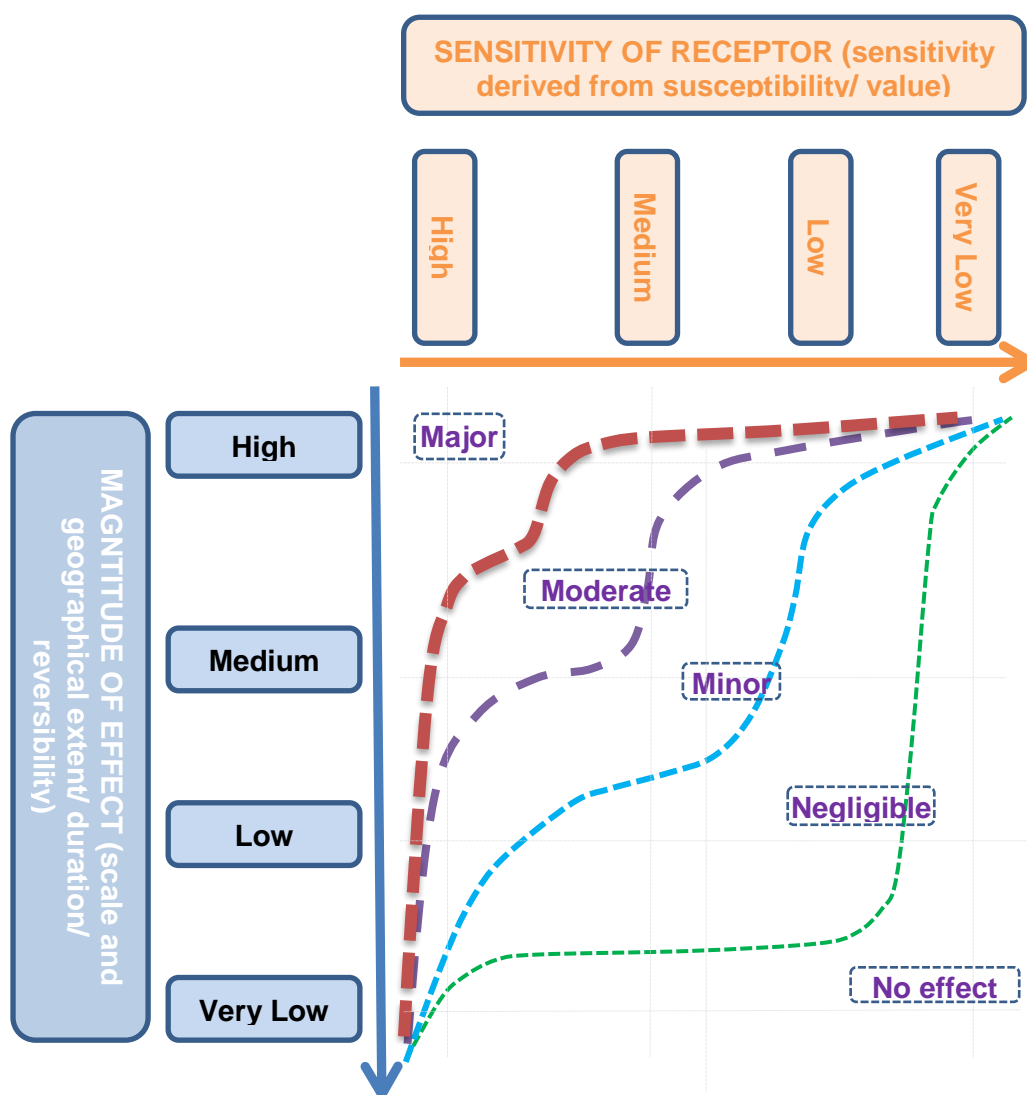
Visual Impact Assessment Methodology

- 11.3.14 The assessment of effects likely to result from visual impacts is structured by receptor groups (e.g. residents, users of Public Rights of Way (PRoW) and business users). Individual receptors are identified through the definition of the ZTV, within which views of the Proposed Development are likely to be possible. Individuals are subsequently categorised into receptor groups within different areas. The sensitivity of each receptor group is then evaluated as being high, medium, low or very low dependent upon their susceptibility to changes in views and visual amenity and the value attached to particular views (in accordance with the criteria set by the Landscape Institute and Institute of Environmental Management and Assessment (Landscape Institute and IEMA, 2013)).
- 11.3.15 Views from each identified representative viewpoint, as agreed with NELC, were photographed and recorded, considering location, distance from the Proposed Development (as the crow flies), direction of view, receptor type, sensitivity and a short description of the view.
- 11.3.16 Viewpoint photography accompanying this assessment has been undertaken based upon the guidance given in Landscape Institute Advice Note 01/11 'Photography and photomontage in landscape and visual impact assessment (Landscape Institute, 2011).
- 11.3.17 To facilitate the reader's interpretation of the information, photomontages and wireframes of the Proposed Development are presented on Figures 11.16 – 11.19 in PEI Report Volume II.
- 11.3.18 The sensitivity of a receptor is evaluated as being high, medium, low or very low dependent upon the susceptibility to changes in the view and visual amenity, and the value attached to the view. The magnitude of impact is evaluated as being high, medium, low or very low dependent on the magnitude of change in relation to the baseline view

resulting from the Proposed Development. The specific terminology used to describe the sensitivity of receptors and magnitude of impacts is presented within Appendix 11A in PEI Report Volume III.

- 11.3.19 For the purposes of assessment, the sensitivity of a receptor and the magnitude of an impact on that receptor are combined to determine the effect that the Proposed Development is predicted to have on existing baseline visual conditions for that given receptor with reference to the diagram at Table 11.1. This varies from the standard effects matrix set out in Chapter 2: Assessment Methodology, but follows best practice methodology for landscape and visual impact assessment (Landscape Institute and IEMA, 2013).
- 11.3.20 Although some visual receptors may consider the Proposed Development to be visually interesting, the assessment follows standard best practice methods, and therefore assumes a 'worst case' scenario, whereby significant changes to views as a result of new tall/ large structures or buildings, in an existing relatively open area, are generally considered to be adverse.
- 11.3.21 Effects that are judged as being moderate or major are considered to be significant.

Table 11.1: Classification of landscape and visual effects



Study Area and Key Parameters for Assessment

- 11.3.22 The magnitude of visual impacts of the Proposed Development relate to (amongst other criteria) the size and scale of the structures and geographical extent of the area influenced by them. The assessment is based upon the largest possible dimensions for the Proposed Development (adopting a 'Rochdale Envelope' approach), and stack heights of 100 m (based on a ground level of 2 m Above Ordnance Datum (AOD), with the top of both stacks fixed at 102 m AOD), as this is considered to represent the worst case scenario. The maximum dimensions are based upon the building footprint and tallest potential height as detailed in Chapter 4: The Proposed Development.
- 11.3.23 The extent of the Study Area is determined by the potential visibility of the Proposed Development in the surrounding landscape and is proportionate to its size and scale and the nature of the surrounding landscape. Current guidance (Landscape Institute and IEMA, 2013) states that the Study Area should include *"the full extent of the wider landscape around it which the proposed development may influence in a significant manner"*.
- 11.3.24 For the purposes of this assessment the Study Area has been defined by a combination of analysis of the ZTV and professional judgment of the likely extents of effects, as well as consultation with NELC in respect of the Consented Development. Based upon the geographical extent of the Proposed Development, it is considered unlikely that significant landscape effects would be possible beyond 5 km from the Proposed Development. Therefore a 5 km Study Area boundary has been used in the consideration of landscape and visual effects within this chapter. For the Consented Development ES a single viewpoint at a distance of 10 km, within the Lincolnshire Wolds Area of Outstanding Natural Beauty (AONB), was considered at the request of NELC. The Consented Development EIA concluded that as the AONB is over 8 km from the Site and views to the Site are distant and partially obscured by the existing South Humber Bank Power Station (SHBPS) there would be negligible impact on the AONB. Given that the nature and scale of the Proposed Development is the same as the Consented Development the Study Area for the Proposed Development is retained at 5 km and the Lincolnshire Wolds AONB viewpoint has been scoped out of the assessment presented in this Chapter.

Zone of Theoretical Visibility (ZTV)

- 11.3.25 A computer generated ZTV was produced for the 5 km Study Area and is presented within Figure 11.4 in PEI Report Volume II). OS terrain 5 Digital Terrain Model (DTM) data was used to prepare the ZTV. Screening effects of vegetation, buildings or other structures were not taken into account in the model. Consequently, for the production of this ZTV, OS Vector Map buildings and woodland were incorporated into the DTM.
- 11.3.26 Existing built structures within the Site were modelled using heights defined by OS MasterMap data. Existing built structures outside of the Proposed Development were modelled at 7.5 m in height and large areas of woodland were modelled at 15 m in height to provide a more accurate ZTV than a bare-ground scenario (which does not take into account localised screening effects of vegetation and built form).
- 11.3.27 Potential viewpoints and receptors were identified throughout the Study Area. The potential receptors and their existing views are described within Appendix 11B in PEI Report Volume III and presented on Figures 11.6 to 11.15 in PEI Report Volume II.

Consultation

- 11.3.28 Consultation was undertaken with NELC (July 2018) to agree the location of representative viewpoints for the Consented Development. Comments were also provided at the EIA Scoping stage for the Consented Development by NELC and West

Lindsey Council (September 2018). Further consultation is being carried out with NELC to confirm the viewpoints for the final Environmental Statement (ES) for the Proposed Development. The Scoping Opinion received from PINS on 2nd October 2019 included comments on the scope of the of the landscape and visual amenity assessment. The consultation response by NELC to PINS explained that the EIA Scoping Report captured the relevant information requested by NELC in the scoping opinion in respect of the Consented Development and that NELC have no further comments.

- 11.3.29 Consultation comments received for the Consented Development are considered to be relevant to the Proposed Development and therefore a summary of all consultation comments received to date for the Consented Development and Proposed Development and all additional viewpoints considered is presented in Table 11.2 below. Refer to Appendix 11B in PEI Report Volume III for a list all of the viewpoints identified and reviewed.

Table 11.2: Viewpoint consultations summary

CONSULTEE COMMENT	SUMMARY OF RESPONSE/ HOW COMMENTS HAVE BEEN ADDRESSED
North East Lincolnshire Council (NELC) (in respect of the Consented Development)	
Paul Chaplin e-mail dated 23/07/18: <i>"Although views from the Lincolnshire Wolds are outside of the radius I suggest you take these views into account. Capturing these views would address issues should they be raised"</i> .	The advice was noted and the best view of the Humber Bank toward Immingham/ Stallingborough, located on a popular footpath up into the Wolds, was agreed and included within the Consented Development assessment. The viewpoint was located within the Wolds Area of Outstanding Natural Beauty.
NELC Scoping Opinion dated 03/09/18 Consider the inclusion of an additional viewpoint in Great Coates.	This was noted and reviewed. A viewpoint representing residential views from Great Coates, beyond Beechwood Farm Carvery (Viewpoint 5) to the south-east, was suggested by NELC. The views from this location were considered during an additional site visit. A representative viewpoint from properties along Woad Lane, close to Great Coates railway station, was subsequently reviewed. Due to the increased distance (1.2 km) beyond Viewpoint 5, vegetation to the rear of properties, vegetation along the A180 in the mid foreground and the intervening proximity of structures associated with the Lenzing industrial site, the anticipated impact was deemed to be less than Viewpoint 5 and therefore not significant. This viewpoint was therefore not included in the detailed assessment for the Consented Development and has consequently not been included in the assessment for the Proposed Development.

CONSULTEE COMMENT	SUMMARY OF RESPONSE/ HOW COMMENTS HAVE BEEN ADDRESSED
West Lindsey Council (in respect of the Consented Development)	
<p>NELC Scoping Opinion dated 03/09/18 Consider the inclusion of an additional viewpoint from the top of Pelham's Tower.</p>	<p>This was noted and reviewed. A viewpoint representing views from the glazed viewing room at the top of Pelham's Tower was suggested by West Lindsey Council. The views from this location were subsequently considered during an additional site visit. Due to the density and height of the surrounding vegetation, a representative viewpoint was selected at the highest point on the A1173 with an open view in the direction of the Proposed Development. Due to the distance (14 km), the absence of public footpaths to the tower base, intervening vegetation at ground level and the limited period of access (open day for 3 hours on one day each year) to the top of the tower, the impact was not deemed to be significant. The height of the tower (39 m) above the 132 m AOD level will also reduce the extent to which the new development will appear on the skyline. This viewpoint was therefore not included within the Consented Development assessment. and has consequently not been included in the assessment for the Proposed Development.</p>
Planning Inspectorate (Proposed Development EIA Scoping Opinion, October 2019)	
<p>In relation to the scope of the Study Area for the Proposed Development Landscape and visual impact assessment <i>"The Inspectorate notes that the Zone of Theoretical Visibility model for the extant planning permission will be reviewed for the purposes of the assessment in the ES. The ES should clearly explain how the zone of influence for the Proposed Development has been defined and how this has been reflected in the definition of the study area".</i></p>	<p>The definition of the Study Area and method for determining the Zone of Theoretical Visibility are described at paragraphs 11.3.22 to 11.3.27 above.</p>
<p>In relation to the locations of representative viewpoints and photomontages</p>	<p>Consultation with NELC is in progress and will be reported in the final ES, but as noted in the EIA Scoping Report (see Appendix 1A in PEI Report Volume III), the viewpoints are expected to be</p>

CONSULTEE COMMENT	SUMMARY OF RESPONSE/ HOW COMMENTS HAVE BEEN ADDRESSED
<p><i>“The intention to agree the location of representative views and photomontages with consultees is welcomed. The ES should include evidence of any such agreement. It is noted that the locations are expected to be the same as for the assessment of the extant planning permission. The Applicant should ensure that the viewpoints and photomontages are adequate to allow an assessment of the impacts of the Proposed Development and takes account of the structures associated with the increased generating capacity”.</i></p>	<p>the same as those selected for the Consented Development assessment because the stack heights are the same.</p>

11.4 Baseline Conditions

Landscape Characterisation

- 11.4.1 At a national scale, the 5 km Study Area includes National Character Area (NCA): 41 Humber Estuary and NCA 42: Lincolnshire Coast and Marshes (Natural England, 2013a and 2013b). The relevant landscape character elements of the NCA documents are summarised below.

NCA 41: Humber Estuary

- 11.4.2 The Humber Estuary is an open, low-lying flat landscape influenced by the changing character of the river. The area is characterised by arable farming in large regular fields on the reclaimed, formerly inter-tidal landscape. Intertidal habitats include mudflats, salt marsh and reed beds, coastal dunes and wetlands along the side of the estuary. Internationally valuable habitats are in strong contrast to the urban and industrial landscape surrounding Hull and the south banks of the Humber Estuary.

NCA 42: Lincolnshire Coast and Marshes

- 11.4.3 The Lincolnshire Coast and Marshes lie south-east of Hull, this is an area of predominantly flat land, sparsely wooded with open views. The coastal strip has been developed during the 20th century as a tourist destination and larger settlements are located along the coast. Much of the agricultural land of the Outmarsh has been reclaimed from the sea over many centuries. Food production is important within the NCA with cereals, root crops, oilseed and a very small amount of vegetables grown. There is also mixed farming and pastoral land grazed by cattle and sheep with areas of grazing marsh.
- 11.4.4 The Study Area is characterised within the North East Lincolnshire Landscape Character Assessment, Sensitivity and Capacity Study 2015 (NELLCA). Local Character Areas (LCAs) within the assessment, relevant to the Study Area and on a regional scale, are described below.

Humber Estuary

11.4.5 Within the NELLCA the Humber Estuary is described as follows:

“The Humber Estuary is an expansive, flat and low-lying landscape in which agriculture, industrial/urban and semi-natural habitat land uses combine to provide local variety in an otherwise simple, sometimes bleak landscape. The estuary itself can sometimes present a somewhat sombre appearance, particularly at low tide when extensive areas of mud flat are exposed. In contrast, at high tide the estuary has a brighter, more attractive coastal feel. The dynamics of tides, changing weather, bird life and visible activity on the estuary sometimes combine to create a vibrant scene. However, in many areas views of the water are blocked by flood alleviation berms and the estuary’s presence is perceived only through the more subtle influences such as the smell of salt laden air”.

11.4.6 Many of the poorly drained alluvial soils around the Estuary are now of high agricultural value. This is largely due to the extensive drainage improvements carried out over the past few centuries, including the cutting of new drainage channels, enlarging and diverting existing watercourses, construction of flood alleviation berms, sluices and installation of pumps.

Lincolnshire Coast and Marshes

11.4.7 Soils derived from the glacial till form extensive tracts of good generally fertile arable land, although the drainage is not always satisfactory and often impeded. In common with most farmed landscapes derived from glacial deposits of boulder clay, gravels and sands, drainage and cultivation have led to losses of most grassland and woodland of interest. Nevertheless, pockets of the natural woodland of slightly base-rich derivation remain. These are found in the form of certain mature hedges, streamside woodlands and the ground flora of replanted farm woodlands. The Lincolnshire Coast and Marshes forms a transition zone between the higher Wolds and the coast.

11.4.8 The Study Area includes three Local Landscape Types (LTs) within North East Lincolnshire that are identified in Section 5 (Character) of the NELLCA (NELC, 2015); LT 1 Industrial Landscape, LT 2 Open Farmland and LT 3 Wooded Open Farmland. The key characteristics of these LT are described below:

Landscape Type 1: Industrial Landscape

11.4.9 The Industrial Landscape is visually intrusive, stretching from the north-western edge of Grimsby up to and around Immingham. It is dominated by on-shore oil and gas refineries and other large scale industrial units and extends inland to the A180.

11.4.10 The key characteristics are described within the NELLCA document as:

- *“Virtually flat landform emphasising large skies;*
- *Large scale industrial works (including Immingham power station) and docks;*
- *Medium to large scale open arable farmland;*
- *Open views sometimes interrupted by large scale built development;*
- *High and low voltage pylons criss-crossing the area have an urbanising effect;*
- *Network of busy roads including the main A180 transport route;*
- *Tall native hedgerows and mature trees along road corridor;*
- *Extensive network of field drainage dykes including several large named drains; and*
- *Immingham town, northern periphery of Grimsby, scattered farmsteads”.*

Landscape Type 2: Open Farmland

11.4.11 This extends northwards from the outskirts of Grimsby. Its western edge runs parallel with the main railway line and its eastern edge follows the A180.

11.4.12 The key characteristics are described within the NELLCA document as:

- *“Virtually flat landform emphasising large skies;*
- *Medium to large scale open arable farmland;*
- *Open views towards settlement edges and industry/docks;*
- *High voltage pylons have an urbanising effect;*
- *Network of busy roads including the main A180 transport route and the Grimsby to Doncaster railway line;*
- *Mature native hedgerow field and roadside boundaries with hedgerow trees, particularly in the north, tending to become sparse and to the north and west of Healing;*
- *Extensive network of field drainage dykes including Main Drain; and*
- *Village settlements of Healing, Stallingborough and Habrough, scattered farmsteads”.*

Landscape Type 3: Wooded Open Farmland

11.4.13 This lies to the west and north-west of Grimsby and Cleethorpes. Its northern extent lies on the Borough boundary near Habrough and its southern extent at the Borough boundary near Holton-le-Clay. The Borough boundary and the A18 mark its western edge and the outskirts of Grimsby and Cleethorpes, the B1210 and main railway line its eastern edge.

11.4.14 The key characteristics are described within the NELLCA document as:

- *“Virtually flat landform emphasising large skies, though some gentle undulations are evident;*
- *Medium to large scale open arable farmland;*
- *Open views sometimes interrupted by woodland blocks;*
- *High and low voltage pylons have an urbanising effect;*
- *Network of busy roads including the A46, A1173, B1210 but also a network of quiet local lanes;*
- *Well established low cut native hedgerow field and roadside boundaries with hedgerow trees;*
- *Tall native hedgerows and mature trees along lanes;*
- *Internal hedgerows tend to be more sparse and fragmented around Aylesby and east of Laceby;*
- *Small watercourses; North Beck Drain, Laceby Beck, Waithe Beck, and an extensive network of field drainage dykes;*
- *Nucleated settlement pattern of villages and hamlets, scattered farmsteads; and*
- *The Wanderlust Way (local trail)”.*

11.4.15 The Study Area is broken down into Landscape Sub Units in the NELLCA document. Four of these Sub Units have borders that fringe the Site. These are identified in Section

6 (Sensitivity and Capacity) of the NELLCA document. The opportunities and recommendations in relation to land use, management and GI and the units overall sensitivity to change are summarised below.

Grimsby and Cleethorpes Sub Unit GC (i)

11.4.16 This pocket of land is located to the south-east of the Site and its key opportunities and recommendations state that new development should be set within a green infrastructure framework and include structural landscape planting. Existing vegetation should be retained, enhanced and supplemented, including landscape buffers to minimise visual impact on the wider landscape. Public Rights of Way (PRoW) and drainage dykes should be incorporated into green corridors.

11.4.17 There are also opportunities to enhance vegetation along drainage dykes, conserve the historic field pattern and reinforce hedge lines. It is assessed within the NELLCA document that the overall sensitivity to change is low and the capacity to accommodate development is medium-low.

Healing Sub Unit He (i)

11.4.18 This pocket of land is located to the south of the Site. The detailed recommendations in relation to this sub unit include the provision of new suitable landscape planting to further buffer and contain Meadows Farm, Meadow Cottages and The Meadows as well as screening along the railway corridor to mitigate visual and noise effects. Opportunities include an increase in hedgerow and hedgerow tree cover; improve field margins for biodiversity, hedgerow and woodland enhancement and management including the planting of copses and woodland blocks whilst retaining the visually open character. It is assessed within the NELLCA document that the overall sensitivity to change is low and the capacity to accommodate development is low.

Stallingborough Sub Unit S (i)

11.4.19 This pocket of land is located to the south-west of the Site and includes recommendations for additional planting to buffer the existing residential edge and appropriate planting along the perimeter of any development to minimise impacts on the wider landscape.

11.4.20 Opportunities include the creation of an improved transition between the existing settlement edge and adjacent rural areas. It is assessed within the NELLCA document that the overall sensitivity to change is medium and the capacity to accommodate development is medium-low.

Immingham Sub Unit I (iii)

11.4.21 This pocket of land is located to the west of the Site and includes recommendations for additional landscape planting to further buffer Mauxwell and Highfield Farms as well as along the A180 corridor. An appropriate buffer should also be provided along the south-eastern perimeter of any development to minimise impacts upon the wider landscape.

11.4.22 Opportunities include the creation of an improved transition between the existing settlement edge and adjacent rural areas. It is assessed within the NELLCA document that the overall sensitivity to change is medium-low and the capacity to accommodate development is high-medium.

11.4.23 The study area extends to the north bank of the Humber which is described within the ERYC Landscape Character Assessment as Landscape Character Type (LCT) 21 Low Lying, Drained Farmland.

LCT21 Low Lying, Drained Farmland

11.4.24 The LCT21 Low Lying, Drained Farmland contains “the low-lying plain of the Humber Estuary, sparse tree cover and open, extensive views across the remote landscape, confined by the urban area of Hull. Salt End to the east of Hull provides a strong industrial influence on views of this area”. It is assessed in the ERYC document that the LCT has a high value and high susceptibility to industrial development.

Table 11.3: Summary of Landscape Character Areas

SCALE	CHARACTER ASSESSMENT	CHARACTER AREA
National	Natural England (2014), NCA Profile 41: Humber Estuary	41: Humber Estuary
	Natural England (2014), NCA Profile 42: Lincolnshire Coast and Marshes	42: Lincolnshire Coast and Marshes
Regional	North East Lincolnshire Landscape Character Assessment, Sensitivity and Capacity Study 2015 (NELLCA)	Humber Estuary Local Landscape Type (LLT)
	North East Lincolnshire Landscape Character Assessment, Sensitivity and Capacity Study 2015 (NELLCA)	Lincolnshire Coast and Marshes LLT
Local	North East Lincolnshire Landscape Character Assessment, Sensitivity and Capacity Study 2015 (NELLCA)	Landscape Type 1: Industrial Landscape
	North East Lincolnshire Landscape Character Assessment, Sensitivity and Capacity Study 2015 (NELLCA)	Landscape Type 2: Open Farmland
	North East Lincolnshire Landscape Character Assessment, Sensitivity and Capacity Study 2015 (NELLCA)	Landscape Type 3: Wooded Open Farmland
	East Riding of Yorkshire Landscape Character Assessment	Landscape Character Type 21: Low Lying, Drained Farmland

The Site and Its Immediate Setting

11.4.25 The Main Development Area is largely flat and typically stands at around 2 m above Ordnance Datum (AOD), largely comprising grassland with an access road to an adjacent pumping station. In the north-east of the Main Development Area there is some scattered scrubby vegetation with discrete sections of free-standing hedgerow. Drainage ditches run along the northern, western and southern perimeters of the Site.

11.4.26 The area surrounding the Main Development Area immediately to the south and north-west is in agricultural use, with a polymer manufacturing site (Synthomer (UK) Limited) and the NEWLINCS waste management facility both located to the north beyond South Marsh Road. The Humber Estuary lies around 175 m to the east of the Main

Development Area beyond the existing SHBPS cooling water pumping station. The west of the Main Development Area adjoins the existing SHBPS.

- 11.4.27 Beyond arable and unmanaged land, immediately to the south of the Site, lies a large industrial complex including chemical works and bio-refineries for textile production associated with Lenzing Fibres. There are two stacks associated with this industrial complex. This area, and the commercial development beyond, is bordered by medium scale arable farmland with field drain boundaries. Trees are limited to areas of well scattered field boundary trees, occasional copses, planting associated with the dock railway 600 m to the south and screen planting associated with the aforementioned industrial and commercial developments.
- 11.4.28 The landscape to the south-west of the Site is predominantly arable fields up to and beyond the A180 towards the residential periphery of Great Coates and Healing. In closer proximity is an area of scrub and woodland associated with a large pond south of Oldfleet Drain, approximately 400 m away.
- 11.4.29 Beyond the existing South Humber Bank Power Station at the west of the Site lies arable and unmanaged land. A linear belt of trees associated with the dock railway is situated 700 m to the west with well managed arable fields and scattered farmsteads between this and the A180 and villages of Stallingborough and Healing, further west.
- 11.4.30 Arable land to the north-west beyond the existing power station quickly gives way to industrial land uses including gas, oil and vehicle storage facilities. Stacks and plumes are more prevalent in this area. The south and eastern residential periphery of Immingham is situated beyond just within the 5 km Study Area boundary.
- 11.4.31 Land to the north is occupied by the aforementioned industrial complexes of Synthomer (UK) and NEWLINCS waste management facility. The latter site includes one stack.
- 11.4.32 High voltage pylons frequently interrupt the horizon to the west of the Site.

Vegetation Cover

- 11.4.33 The Study Area is characterised by occasional small deciduous woodland blocks and intermittent hedgerow/ scrub boundaries along the transport routes which include road and rail. Marginal planting is often associated with field drains which commonly divide the arable fields.
- 11.4.34 Agricultural fields within the Study Area are rectilinear and vary in size. Fields in the immediate vicinity are predominantly bordered by large open drains and associated wetland habitat including Bull Rushes. Woodland screen planting to the west and southern perimeter of the South Humber Bank Power Station provides low level screening. Field boundaries closer to the 5 km boundary, beyond the A180, are often comprised of low hedgerows and well scattered hedgerow trees.
- 11.4.35 Blocks of mature woodland are uncommon and widely spaced throughout remaining areas of greenspace.
- 11.4.36 The Main Development Area comprises unmanaged rough grassland with sparse scrub and marginal vegetation associated with an open drainage channel to the southern and northern boundaries. This habitat is of local landscape value.

Topography and Drainage

- 11.4.37 The Main Development Area lies at approximately 2 m AOD. The wider landscape is predominantly flat and low lying, being between 1 and 15 m AOD, with the land rising slightly to the north-west. Localised areas of high ground, rising to around 40 m AOD, lie within open areas of farmland at the westerly extent of the Study Area.

Settlements

- 11.4.38 Immingham is the largest settlement in the Study Area and lies approximately 3.8 km to the west-north-west of the Proposed Development. The settlement pattern within the Study Area comprises small and medium sized villages including Stallingborough and Healing. The suburbs of Grimsby, including Great Coates, Little Coates and West Marsh, is located to the south. Isolated properties and farmsteads are scattered throughout the Study Area.
- 11.4.39 Larger settlements in the Study Area are connected by the A180 which runs in a north-west/ south-east direction linking Immingham with Grimsby. The smaller settlements of Stallingborough and Healing are linked by the B1210 to the south-west, whilst the A1136 to the south links the suburbs of Grimsby. Two rail lines run parallel to the A180. The rail line to the north links the docks of Immingham and Grimsby and is crossed at road level. The rail link to the south of the A180 forms part of the Northern line from Cleethorpes to Hull. Crossing points are at road level along minor roads with major roads crossing via bridges. A number of minor roads and tracks link smaller settlements and farmsteads within the Study Area.
- 11.4.40 PRoWs associated with the Humber Estuary or linking settlements, are presented on Figure 11.3 in PEI Report Volume II.
- 11.4.41 There are no long distance walking or cycling routes that pass through the Study Area. However, a route along the Humber Estuary approximately 175 m to the east of the Site joins a local path linking to Hobson Way 500 m to the north. There are no other PRoWs within a 1.5 km radius.

Value of the Landscape Receptor

- 11.4.42 The 5 km Study Area contains no national statutory designations relating to landscape value. The northern border of the Lincolnshire Wolds AONB lies approximately 8.5 km to the south-west of the Proposed Development and, as a result of distance, the landscape effects have been assessed to be negligible. The Humber Estuary also has national designations for ecology in the form of a Site of Special Scientific Interest (SSSI), Special Protection Area, Special Area of Conservation, and Ramsar.
- 11.4.43 There are no Registered Parks and Gardens located within the Study Area.
- 11.4.44 The Study Area has no local designations relating to landscape value, although mature woodland copses, hedgerows and marginal vegetation associated with drainage ditches between fields are significant features within landscape dominated by medium to large scale arable fields.
- 11.4.45 The Main Development Area is bordered by vegetated drainage channels to the south and north.
- 11.4.46 Table 11.4 below describes the factors relating to the value of the landscape at the Site and Study Area scale.

Table 11.4: Landscape value factors

FACTOR	STUDY AREA	SITE
Landscape quality (condition)	The landscape of the Study Area includes open, low lying agricultural land influenced by industry, power stations, pylons and transport routes.	Land-use relates to power production, and is typical of the industrial land uses adjacent to the Estuary but not the wider Study Area inland.
Scenic quality	The Study Area is low lying, allowing views across an agricultural landscape to settlement edges and industrial sites/ docks. Large structures such as power station stacks and infrastructure associated with energy and powerline routes are widely visible across the Study Area.	The Site is strongly influenced by its industrial past and has little scenic quality. However, parts include well vegetated perimeter drainage channels which provide visual interest.
Rarity	The landscape of the Study Area is typical of the wider landscape context regionally.	The Site is typical of the local area.
Representativeness	The Study Area does not contain elements or characteristics that are particularly important examples.	This is not relevant to the Site as it does not contain elements or characteristics that are particularly important examples.
Conservation interests	The Study Area contains a SSSI, a scheduled monument west of Stallingborough, listed buildings and a conservation area at Great Coates.	The Site does not contain any conservation interests though it borders the Humber Estuary SSSI.
Recreation value	Taken as a whole, the landscape of the Study Area is of some recreational value, restricted mainly to the use of, PRowS, the Humber Estuary and village sports and recreation grounds.	The Site has no recreational value and is not accessible to the public.

FACTOR	STUDY AREA	SITE
Perceptual aspects	The Study Area contains some areas which can be regarded as tranquil and remote. However, access tends to be limited to PRowS and minor local roads. Distant views are often interrupted by transport corridors, pylons, stacks, industrial development, housing and woodland blocks.	The Site is heavily influenced by power production.
Overall landscape value	<u>Low</u> The Study Area includes large areas of farmland whilst being heavily influenced by industrial developments and transport corridors. Valued at local level.	<u>Low</u> The Site is an area of previously developed land with no important landscape features.

Overall Character and Key Characteristics of the Study Area

- 11.4.47 The topography of the Study Area is a considerable factor in defining the character of the area with the relatively flat landscape often interrupted by broken lines of vegetation associated with transport corridors, and to a lesser extent, field boundaries. Long distance views are available from higher areas in the Study Area and coinciding spaces between areas of vegetation.
- 11.4.48 The published landscape character assessments, including Humber Estuary (NCA 41), recognise that there are strong contrasts within the landscape. Tranquil, open and expansive areas dominated by farming contrast with large towns such as Immingham, and the industrial complexes along the Estuary itself.

Existing Visual Baseline

Visual Receptors

- 11.4.49 In order to identify receptors with potential views of the Main Development Area, a ZTV has been produced that identifies what percentage of the structure is likely to be visible and from where. The ZTV is presented on Figure 11.4 in PEI Report Volume II.
- 11.4.50 Potential viewpoints and receptors were identified throughout the Study Area. The potential receptors and their existing views are described in Appendix 11B in PEI Report Volume III and presented on Figure 11.1 in PEI Report Volume II.
- 11.4.51 Visibility within the Study Area is generally widespread as a result of the low land form, though intervening features such as hedgerows, woodland blocks, road/ rail embankments and settlements restrict views.

Dynamic Views

- 11.4.52 Users of the main transport routes may gain dynamic views towards the Site, to varying degrees, dependent on intervening structures, screening vegetation, elevation and direction of travel.
- 11.4.53 Users of the A180, travelling in a south-easterly direction, first glimpse views of the existing power station from approximately 4.5 km from the Site and from 2.1 km travelling from the west. Views are often wide and expansive where screening vegetation, cuttings and roadside development do not screen the views. Industrial infrastructure along the Humber Estuary and associated power lines are often the most prominent skyline feature on clear days.
- 11.4.54 Users of the local railway lines within the Study Area gain transient, dynamic views of the existing power station. This is seen in the context of a landscape containing other large scale structures such as power stations, overhead power lines, highway and the dockside infrastructure of Immingham and Grimsby.
- 11.4.55 There are a number of minor local roads in close proximity to the Site which provide links between farmsteads and settlements. Generally views from these roads will be dynamic and ever changing. Views are often broken or restricted by screening vegetation and built form located along the road corridors. Where views are open, the structures associated with the existing South Humber Bank Power Station are clearly visible, appearing most prominently at a distance within 1.5 km of the Site.

Visual Receptors and Representative Viewpoints

- 11.4.56 Through previous consultation with North East Lincolnshire Council (NELC), a total of nine final representative viewpoints have been chosen to illustrate the typical range of views of the Site from within the Study Area, as listed in Table 11.5 below.
- 11.4.57 A summary table of consultations with NELC regarding proposed viewpoints are presented in Table 11.2.

Table 11.5: Representative Viewpoints

VIEWPOINT ID	NAME & LOCATION	RECEPTOR TYPE	GRID REFERENCE	DESCRIPTION OF VIEW
1	Farmshop Hotel A180	Hotel and Business users	518804, 411844	<p>Views from Stallingborough Road Farmshop Hotel in a north-easterly direction, towards the existing South Humber Bank Power Station site. The skyline is interrupted by power lines and pylons in the mid and background of the view. The background and horizon of the view is dominated by the existing power station infrastructure and woodland. The views across flat arable farmland are interrupted by scattered hedgerow trees and blocks of woodland.</p> <p>Overall the baseline view is assessed as typical of the rural context, with some detracting features, but low value and an ordinary view with no recognised quality: Low in value.</p>
2	Brickfield House South Marsh Rd	Residential users	521293, 412788	<p>Views from the verge of South Marsh Road (adjacent property rear garden) in a north-easterly direction towards the existing South Humber Bank Power Station site. Views from the rear of the property are oblique and mostly blocked by a 2 m high beech hedge garden boundary. The view is predominantly arable farmland with occasional vegetation groups filtering views. Industrial infrastructure north of Grimsby is visible on the horizon with electricity pylons in the mid foreground. Trees and scrub, associated with rail corridors to the north-east, help break up the view of lower level infrastructure.</p> <p>Overall the baseline view is assessed as typical of the rural context, with some detracting features but low value and an ordinary view with no recognised quality: Low in value.</p>

VIEWPOINT ID	NAME & LOCATION	RECEPTOR TYPE	GRID REFERENCE	DESCRIPTION OF VIEW
3	Carr Lane Footpath	PRoW	521096, 412143	<p>Views in a north-easterly direction across arable farmland. Views are partially screened at a lower level by the raised road embankment to the A180 and associated scattered trees and scrub. Industrial infrastructure north of Grimsby is visible on the horizon to the east with electricity pylons visible in the background. Views north are screened by blocks of woodland. Representative of views from the public footpath close to Carr Lane Nursery.</p> <p>Overall the baseline view is assessed as typical of the rural context, with some detracting features but low value and an ordinary view with no recognised quality: Low in value.</p>
4	Cress Cottage	Residential	521902, 412050	<p>Partial views from the rear of the properties towards South Humber Bank Power Station. Electricity pylons are visible in the mid-ground of the view with infrastructure associated with the South Humber Bank Power Station visible in the background, against the skyline. Representative of views from the residential properties around Cress Cottage to the south-west.</p> <p>Overall the baseline view is assessed as typical of the rural context, with some detracting features but low value and an ordinary view with no recognised quality: Low in value.</p>
5	Beechwood Farm Carvery	Inn/ Restaurant	523357, 411478	<p>Distant uninterrupted views across large scale arable farmland which contains elements of industrial infrastructure. Infrastructure on the skyline to the north and north-east includes stacks and large scale industrial sheds associated with the Lenzing Fibres site. Pylons and lower level power lines are also frequently visible across the mid and background of the view. Representative of</p>

VIEWPOINT ID	NAME & LOCATION	RECEPTOR TYPE	GRID REFERENCE	DESCRIPTION OF VIEW
				<p>180° views north across extensive, flat arable fields from windows directly facing the South Humber Bank Power Station.</p> <p>Overall the baseline view is assessed as typical of the rural context, with some detracting features but low value and an ordinary view with no recognised quality and/or is unlikely to be visited specifically to experience the views available: Low in value.</p>
6	Sunk Island	PRoW	523506, 418861	<p>Wide, panoramic view across the Humber Estuary towards an industrial skyline which extends from Grimsby to Immingham in a south-westerly direction. Infrastructure dominates this skyline and includes frequent stacks, silos, sheds and dockside cranes. Contains a significant number of skyline detractors in the direction of view. Representative of 360° views from public footpath close to Stone Creek House and public road from the north.</p> <p>Overall the baseline view is assessed to be valued locally, although is not widely recognised for its quality and has low visitor numbers. The view has no strong cultural associations: Medium in value.</p>
7	Immingham south	Residents / PRoW users	518577, 413771	<p>Partially elevated (8 m AOD), 180° views in a south-easterly direction from a public footpath across arable fields close to the southern residential periphery of Immingham village. An uninterrupted foreground affords far reaching views in the direction of the Site. Power lines cross the view in the mid and far distance. Infrastructure associated with the South Humber Bank Power Station is located in the background, visible against the</p>

VIEWPOINT ID	NAME & LOCATION	RECEPTOR TYPE	GRID REFERENCE	DESCRIPTION OF VIEW
				<p>skyline. Representative of views from the west for residents and PRow users.</p> <p>Overall the baseline view is assessed as typical of the rural context, with some detracting features but low value and an ordinary view with no recognised quality and/or is unlikely to be visited specifically to experience the views available: Low in value.</p>
8	Mauxhall Farm, footpath users	Residents / PRow users	519177, 413200	<p>View across grazing pasture and the raised alignment of the A1173. Views are partially obscured by intermittent scrub and tree planting along the road embankment. Power lines occupy the near and mid distance of the view, with larger pylons occupying the landscape beyond. Industrial elements, including those within the South Humber Bank Power Station, are located in the distance, visible against the skyline. Representative view for residents and PRow users in an easterly direction.</p> <p>Overall the baseline view is assessed as typical of the rural context, with some detracting features but low value and an ordinary view with no recognised quality and/or is unlikely to be visited specifically to experience the views available: Low in value.</p>
9	Middle Drain footpath users	PRow	522276, 413642	<p>Close proximity view from a public footpath in a south-easterly direction across an arable field to the South Humber Bank Power Station and the Main Development Area. The view is uninterrupted and dominated by infrastructure associated with the South Humber Bank Power Station and adjacent waste</p>

VIEWPOINT ID	NAME & LOCATION	RECEPTOR TYPE	GRID REFERENCE	DESCRIPTION OF VIEW
				<p>management facility (NEWLINCS). Representative of close range views from the north-west.</p> <p>Overall the baseline view is assessed as typical of the rural context, with some detracting features (existing power, chemical and waste related infrastructure) but low value and an ordinary view with no recognised quality and/ or is unlikely to be visited specifically to experience the views available: Low in value.</p>

Summary of Visual Baseline

- 11.4.58 The area is characterised by large scale existing industrial developments including the existing South Humber Bank Power Station, chemical engineering installations, waste disposal and oil and gas facilities. These areas are often separated by small sections of arable farmland which become more extensive further west and south towards the outskirts of local villages. These are recognisable features within the local landscape. The relatively flat landscape is often interrupted by broken lines of vegetation associated with transport corridors and field boundaries. However, long distance views are available through and over existing areas of vegetation to taller industrial buildings and structures on the skyline to the east.
- 11.4.59 Planting to the west and south-west perimeter of the South Humber Bank Power Station currently offers screening to ground level infrastructure.
- 11.4.60 Views available from receptors range from close proximity to long distance. A number of receptors are located within villages and to the perimeter of surrounding suburban areas. Views tend to be from the edges of settlements or PRow where there is limited intervening vegetation and structures restricting views.

Future Baseline

- 11.4.61 As the South Humber Industrial Investment Programme is progressed and brownfield sites are redeveloped, the area around the Site is expected to become more industrial in nature than described for the existing baseline. It is assumed that there will be new areas of commercial and industrial development north and south of the docks rail link and possible residential expansion around existing settlement boundaries within the wider Study Area. It is assessed that the general landscape character within this area of the Humber Estuary would remain, but with large scale industrial developments covering a greater area. Refer to Chapter 17: Cumulative and Combined Effects for details on other proposed developments.
- 11.4.62 It is assessed that the Study Area, close to the Humber Estuary, will continue to be influenced by chemical engineering, waste disposal, oil and gas facilities, power station complexes, large scale industrial buildings and transport corridors.
- 11.4.63 If the Consented Development is progressed then the impacts on landscape character and visual amenity as described in Section 11.6 will have already occurred. As such it is assessed that there will be further industrialisation of the Site and an increase in massing of structures within views of the Site.

11.5 Development Design and Impact Avoidance

- 11.5.1 The Main Development Area will be largely cleared for construction works. Any future landscape proposals will seek to retain existing boundary features such as drainage channels and associated habitat, including fragmented hedgerow where possible.
- 11.5.2 Supplementary planning guidance within the Countryside Design Summary (Estell Warren Landscape Architects for NELC, 1999) regarding industry and infrastructure developments within the Humber Estuary will inform development of the detailed design of the Proposed Development. In particular, the following design principles within the Countryside Design Summary will be considered where required:
- how the built form of proposed structures relates to landscape character;
 - how colour may be used to either integrate the Proposed Development with the landscape, reflect the character of the surrounding landscape or to relate to what the buildings will be seen against;

- how the Proposed Development will relate to existing landscape or built features and its immediate setting in views from key locations;
- whether provision of screening and/or reduction of massing may be utilised where sensitive views are identified; and
- how landscape mitigation may reflect and reinforce local character.

11.5.3 The following impact avoidance measures will either be incorporated into the design or will be standard construction or operational methods. These measures have therefore been taken into account during the impact assessment process described in this chapter:

- suitable materials will be used, where possible, in the construction of structures to reduce reflection and glare and to assist with breaking up the massing of the buildings and structures;
- visual clutter will be minimised where possible through careful design; and
- lighting required during the construction and operation stages of the Proposed Development will be designed to reduce unnecessary light spill outside of the Site boundary.

11.6 Likely Impacts and Effects

11.6.1 This section identifies the potential impacts resulting from the Proposed Development. The magnitude of impacts are defined with reference to the relevant baseline conditions (existing or future, as appropriate), and effects are determined in accordance with the identified methodology presented within Appendix 11A in PEI Report Volume III.

The Proposed Development

11.6.2 The impacts and effects of the Proposed Development compared to a future baseline without the Consented Development are described below.

Landscape Impacts and Effects – Construction and Operation

11.6.3 Landscape impacts and effects are described in Tables 11.7 (construction) and 11.8 (operation).

11.6.4 The potential landscape impacts of the Proposed Development relate to the visibility of new landscape features (temporary and permanent), including how this affects the perceptual qualities and tranquillity of a character area. In the case of the construction and decommissioning of the Proposed Development this will relate to the following:

- movement of plant and heavy goods vehicles, both on Site and in the surrounding area;
- temporary stockpiling of earth and storage of materials;
- establishment of site compounds resulting in temporary structures to serve the workforce;
- crane activity to assist high level construction/ decommissioning works;
- building construction/ decommissioning, including the new stacks; and
- external lighting to illuminate site operations after dark.

11.6.5 In the case of the operational phase of the Proposed Development, impacts will relate to the following:

- introduction of permanent large scale structures including two stacks and main buildings (including the boiler house) within the Proposed Development.

Landscape Capacity

- 11.6.6 It is considered that the landscape located within the LT 1: Industrial Landscape has a high capacity to accommodate the Proposed Development due to the adjacent structures associated with the South Humber Bank Power Station and large scale infrastructure within the wider Study Area.
- 11.6.7 Large scale industrial buildings/ structures and transport corridors located within the Study Area are characteristic features in the landscape. As such it is considered that the construction of the Proposed Development will not introduce any new uncharacteristic landscape elements to the Study Area.

Specific Aesthetic or Perceptual Aspects

- 11.6.8 Large scale industry and power generation is a well-established land use within the Study Area and within the landscape immediately adjacent to the Main Development Area. Although visible within the more remote areas of the Study Area, it is anticipated that the presence of the Proposed Development will not significantly affect the aesthetic and perceptual qualities of the local landscape along the Humber Estuary.
- 11.6.9 During construction and decommissioning there will be changes in the aesthetic and perceptual qualities within close proximity to the Proposed Development through the movement of plant and the introduction or removal of large scale structures in various stages of development and decommissioning. At operation, the aesthetic and perceptual qualities will be altered as a result of the increased mass and height of buildings behind the existing power plant.

Assessment of Landscape Effects

- 11.6.10 The main potential for effects on landscape character relates to the inter-visibility between the Proposed Development and the surrounding LCAs. Given that the Proposed Development is located within an area characterised by large scale industrial, chemical facilities, waste facilities, oil/ gas facilities and power development, it is considered that it is likely to be congruous with its context. Consequently, there is a low potential for the landscape character of the surrounding areas to be affected.
- 11.6.11 Table 11.6 below, provides an assessment of the sensitivity of each landscape receptor. Refer to Tables 11A.1 and 11A.2 in Appendix 11A Landscape and Visual Impact Assessment Methodology in PEI Report Volume III for a description of characteristics in relation to indicative criteria levels.
- 11.6.12 Tables 11.7 to 11.8 provide an assessment of the anticipated magnitude of landscape impacts and the classification of effects on each landscape receptor at construction and operation stages.
- 11.6.13 A full description of all criteria used to assess the above is presented within Appendix 11A in PEI Report Volume III.
- 11.6.14 No significant effects at the National Character Area scale are anticipated and as such they are not considered further in this assessment.

Table 11.6: Landscape Sensitivity Assessment

LANDSCAPE RECEPTOR	SENSITIVITY ASSESSMENT		
	VALUE	SUSCEPTIBILITY	SENSITIVITY
North East Lincolnshire Landscape Character Assessment 2015			
Humber Estuary LLT	Medium	Agricultural and semi-natural areas lie alongside existing large scale industrial developments including power stations and the A180 corridor. The LCA has capacity to absorb the type of development proposed. Susceptibility to change is therefore considered to be low.	Medium
Lincolnshire Coast and Marshes LLT	Medium	As a result of the low-lying, relatively flat landscape and presence of major energy and transport infrastructure, this LCA does offer some capacity to absorb the type of development proposed. Susceptibility to change is therefore considered to be medium.	Medium
Industrial Landscape: LT 1	Low	The low-lying, relatively flat landscape and presence of existing oil and gas refineries and other large scale industrial units, results in the capacity to absorb the type of development proposed. Susceptibility to change is therefore considered to be low.	Low
Open Farmland: LT 2	Medium	A very flat landform containing high voltage pylons, a network of busy roads, Grimsby to Doncaster Railway Line and views of industrial developments and docks. LT 2 has some capacity to absorb this type of development. Susceptibility to change is therefore considered to be medium.	Medium
Wooded Open Farmland: LT 3	Medium	Flat landform of arable farmland with high voltage pylons and a network of busy roads. LT 3 has some capacity to absorb this type of development. Susceptibility to change is therefore considered to be medium.	Medium

LANDSCAPE RECEPTOR	SENSITIVITY ASSESSMENT		
	VALUE	SUSCEPTIBILITY	SENSITIVITY
Low Lying Drained Farmland LCT	High	Low lying flat landscape which displays unique characteristics which vertical structures could impact on the characteristic features. Susceptibility to change is therefore considered to be high.	High
Site Landscape			
Trees/ scrub	Low	A very low number of trees means that this receptor is robust and can accommodate changes due to the Proposed Development. As a result susceptibility to change is considered to be low.	Low
Grassland	Low	Grassland within the Main Development Area is commonplace in terms of landscape character. As a result it can accommodate change related to the Proposed Development and susceptibility is considered to be low.	Low

11.6.15 Due to the existing industrial character of the setting there is a low likelihood that the effects of the Proposed Development during construction will be sufficient to result in an inherent change to the existing landscape character at a local scale and negligible at a regional or national scale. Overall, the influence will be most significant in the localised landscape immediately adjacent to the Proposed Development.

11.6.16 A full description of the criteria used to assess the above is presented within Appendix 11A in PEI Report Volume III.

Table 11.7: Assessment of landscape effects during construction (compared to future baseline without Consented Development)

LANDSCAPE TYPE	SENSITIVITY OF RECEPTOR	DESCRIPTION OF IMPACT	PREDICTED MAGNITUDE OF IMPACT	CLASSIFICATION OF EFFECT
North East Lincolnshire Landscape Character Assessment 2015				
Humber Estuary LLT	Medium	The Proposed Development lies wholly within this LCA. The scale and extent of the change in the baseline character will be localised, of medium duration and reversible. The magnitude of effect on the landscape character is assessed as low, reflecting the limited geographical extent of the change, the nature of construction activity, short term of the construction phase and reversible nature.	Low	Minor adverse (not significant)
Lincolnshire Coast & Marshes LLT	Medium	The Proposed Development lies outside of this LCA but will introduce indirect construction activities within it. Due to existing views of large scale power complexes and transport infrastructure which lie within the adjacent landscape it is considered that the Proposed Development construction will have limited potential to affect the landscape character, perceptive qualities including tranquillity of the LCA in the short term of the construction phase.	Low	Minor adverse (not significant)
Lincolnshire Wolds LLT	Medium	The Proposed Development lies outside of this LLT and will introduce construction activity within views from it. Due to existing distant views of large scale power complexes, pylons and transport infrastructure it is considered that the Proposed Development construction will have limited potential to affect the landscape character, perceptive qualities including tranquillity of the LCA in the short term of the construction phase.	Low	Minor adverse (not significant)

LANDSCAPE TYPE	SENSITIVITY OF RECEPTOR	DESCRIPTION OF IMPACT	PREDICTED MAGNITUDE OF IMPACT	CLASSIFICATION OF EFFECT
Industrial Landscape: LT 1	Low	The Proposed Development will introduce construction activities into the LT, immediately adjacent to other large scale power developments. The introduction of construction activities will increase the massing of large scale structures within this LT, increasing the influence that the existing power station site has on the wider LT. The introduction of construction activity does have the potential to affect the landscape character and perceptive qualities, including tranquillity of this LT in the short term within a localised area. The scale and extent of the change in the baseline character will be localised, of medium duration and reversible. The magnitude of effect on the landscape character is assessed as low, reflecting the limited geographical extent of the change, the nature of construction activity, short duration and reversible nature.	Medium	Minor adverse (not significant)
Open Farmland: LT 2	Medium	The Proposed Development lies outside of this neighbouring LT but will introduce construction activities along major and minor roads within it and limited views from it. Due to existing views of large scale power, energy, chemical complexes and transport infrastructure which lie within the adjacent landscape it is considered that the Proposed Development construction will have limited potential to affect the landscape character, perceptive qualities including tranquillity of the LT in the short term of the construction phase.	Low	Minor adverse (not significant)
Wooded Open Farmland: LT 3	Medium	The Proposed Development lies outside of this LT but will introduce construction activities along major roads adjacent, minor roads within it and limited views from it.	Very Low	Negligible adverse (not significant)

LANDSCAPE TYPE	SENSITIVITY OF RECEPTOR	DESCRIPTION OF IMPACT	PREDICTED MAGNITUDE OF IMPACT	CLASSIFICATION OF EFFECT
Low Lying Drained Farmland LCT	High	The Proposed Development lies outside of this LCT but will introduce distant views of construction activity at a distance of approximately 5 km. As a result of the existing influence of industrial development the Proposed Development has limited potential to affect the landscape character and perceptive qualities, including tranquillity of the LCT, during the construction phase. Impacts will be short term and reversible.	Very Low	Minor adverse (not significant)
Proposed Development Landscape				
Trees/ scrub	Low	This habitat will be removed to allow for construction.	Low	Negligible adverse (not significant)
Grassland	Low	This habitat will be removed to allow for construction.	Low	Negligible adverse (not significant)

Table 11.8: Assessment of landscape effects during operation (compared to future baseline without Consented Development)

LANDSCAPE TYPE	SENSITIVITY OF RECEPTOR	DESCRIPTION OF IMPACT	PREDICTED MAGNITUDE OF IMPACT	CLASSIFICATION OF EFFECT
North East Lincolnshire Landscape Character Assessment 2015				
Humber Estuary LLT	Medium	The Proposed Development lies within this LCA and thus has potential to have a direct impact. The Proposed Development will introduce larger and taller buildings and stacks compared to the existing SHBPS. Due to the presence of other large scale industrial power and chemical developments and road infrastructure within the LCA the Proposed Development will have a reduced influence on the overall LCA. However, it will still have the potential to affect the landscape character and perceptive qualities, including tranquillity, of the LCA within a localised area. As a result of the increase in the massing of buildings and scale of the Proposed Development it is anticipated that there will be a low impact on landscape character and perception compared with the future baseline scenario.	Low	Minor adverse (not significant)
Lincolnshire Coast & Marshes LLT	Medium	The Proposed Development lies outside of this LCA but will introduce larger and taller buildings compared to the existing South Humber Bank Power Station. The scale and extent of the change in the baseline character will be localised, of long duration and reversible. The magnitude of impact on the landscape character is assessed as low, reflecting the limited geographical extent of the change and reversible nature.	Low	Minor adverse (not significant)

LANDSCAPE TYPE	SENSITIVITY OF RECEPTOR	DESCRIPTION OF IMPACT	PREDICTED MAGNITUDE OF IMPACT	CLASSIFICATION OF EFFECT
Industrial Landscape: LT 1	Low	The Proposed Development lies within this LT and thus has potential to have a direct impact. The Proposed Development will introduce a larger overall power station complex compared to the existing baseline. Due to the close proximity of other large scale power developments and associated infrastructure the Proposed Development will have a reduced influence on the overall LT although still has the potential to affect the landscape character and perceptive qualities, including tranquillity, within a localised area. As a result of the increase in the massing of buildings and scale of the Proposed Development it is anticipated that there will be a medium magnitude of impact on landscape character and perception compared with the future baseline scenario.	Medium	Minor adverse (not significant)
Open Farmland: LT 2	Medium	The Proposed Development lies outside of this neighbouring LT but will introduce larger and taller buildings compared to the existing South Humber Bank Power Station. Due to existing views of large scale power, energy, chemical complexes and transport infrastructure which lie within the adjacent landscape it is considered that the Proposed Development will have limited potential to affect the landscape character, perceptive qualities, including tranquillity, of the LT.	Low	Minor adverse (not significant)
Wooded Open Farmland: LT3	Medium	The Proposed Development lies outside of this LT but will introduce larger and taller buildings compared to the existing South Humber Bank Power Station. Due to existing views of large scale power, energy, chemical complexes and transport infrastructure which lie within the adjacent landscape it is considered that the Proposed Development will have limited potential to affect the landscape character, perceptive qualities, including tranquillity, of the LT.	Low	Minor adverse (not significant)

LANDSCAPE TYPE	SENSITIVITY OF RECEPTOR	DESCRIPTION OF IMPACT	PREDICTED MAGNITUDE OF IMPACT	CLASSIFICATION OF EFFECT
Low Lying Drained Farmland LCT	High	The Proposed Development lies outside of this LT but will introduce distance views of additional tall structures at distance. As a result of the existing influence of industrial development the Proposed Development has limited potential to affect the landscape character and perceptive qualities, including tranquillity of the LCT. Impacts will be long term.	Very Low	Minor adverse (not significant)
Site Landscape				
Trees/ scrub	Low	These landscape elements will be replaced by the constituent structures and associated hard and soft landscaping within the Proposed Development.	Low	Negligible adverse (not significant)
Grassland	Low	This will be removed and replaced by the constituent structures and associated hard and soft landscaping within the Proposed Development.	Low	Negligible adverse (not significant)

Visual Amenity Impacts and Effects – Construction and Operation

11.6.17 Potential visual effects arising from the construction activities may include:

- the introduction of stationary and moving piling rigs, cranes and other high level construction machinery;
- the introduction of low level construction operations including heavy plant movements, lighting, welfare facilities, laydown and storage areas;
- construction vehicles entering and leaving the Proposed Development; and
- the progressive construction of tall structures.

11.6.18 Potential visual effects arising from the operation of the Proposed Development may include the introduction of:

- a building with a height of up to 59 m AOD, with ramps for access into the fuel reception area at around 3.5 m above ground level;
- two stacks with heights of 102 m AOD.
- an air cooled condenser located in a separate but closely located lower level structure;
- plumes, that are expected to be visible an average of 77% of days in an average year (based on plume results from the last 5 years);
- a sub-station located in a separate low level structure to the south of the Main Development Area;
- above ground equipment, reagent silos, ammonia tank and a fuel oil tank to the north facing boundary immediately adjacent to the building;
- above ground fire water pump house and fire water tank; and
- other minor associated infrastructure and auxiliaries/ services including a driver welfare building, an HGV holding area, car parking areas, access roads, bird habitat visual screen fencing to the southern perimeter and perimeter security fencing.

11.6.19 Potential visual effects of the Proposed Development at construction and operation are considered in Table 11.9 by reference to representative viewpoints. The viewpoints were chosen as a range of representative views of the Proposed Development. The assessments contained within this table should be read in conjunction with Figures 11.6 to 11.15 which illustrate the baseline situation at each viewpoint in PEI Report Volume II. A series of photomontages have been prepared and presented in Figures 11.16 to 11.19 in PEI Report Volume II which illustrate the likely visibility of the Proposed Development at four of the assessed viewpoints chosen through professional judgment.

Visible Plumes

11.6.20 The Air Quality dispersion modelling, that has been completed to inform Chapter 7: Air Quality, has provided data to enable an assessment of plume visibility for the Proposed Development. Using Met office data from the past 5 years the 'average' visible plume length is expected to be 90 m with plumes visible an average of 77% of the time. The longest plume can be expected to extend for 855 m with plumes over 100 m visible 35% of the time on average.

Table 11.9: Assessment of effects on visual amenity during construction and operation

VIEWPOINT 1: FARMSHOP HOTEL, A180				
Grid reference	Receptor type	Elevation (mAOD)	Distance from Site (km)	Direction of view
518804, 411844	Hotel and Business users	13.4	4.40	North-east
CONSTRUCTION				
Visual susceptibility to change		Value of view	Sensitivity of receptor	
View forms secondary focus for receptors at this location due to presence of alternative views. Therefore susceptibility is considered to be <u>medium</u> .		Typical view which contains a number of detractors. <u>Low</u>	<u>Medium</u>	
Size/ scale, duration and reversibility of impact at construction				
Medium range views of upper levels of construction activities as a result of intervening, low level vegetation on the horizon. Visible construction activities will appear to the left of the existing South Humber Bank Power Station. As the tallest structures are built, construction activity will become more visible. High level construction activities will be viewed in the context of existing structures, as a larger scale addition to the existing power station structures. There would be no change to the balance of the view. The impact will be <u>short term and reversible</u> .				
Magnitude of impact at construction			<u>Low</u>	
Significance of effect at construction	Hotel/ farmshop visitors		<u>Minor adverse</u> (not significant)	
OPERATION				
Visual susceptibility to change at operation		Value of view	Sensitivity of receptor	
There is no change to susceptibility at this assessment scenario. Therefore susceptibility is considered to be <u>medium</u> .		Typical view which contains a number of detractors. <u>Low</u>	<u>Medium</u>	
Size/ scale, duration and reversibility of impact at operation				
Views of ground level structures will be limited by intervening vegetation. The Proposed Development will be observed to the left of the existing South Humber Bank Power Station and will extend the presence of associated industrial structures. The Proposed Development will be largely characteristic of the existing skyline view extending south with large power lines on the horizon the north. The structures will be larger in scale and mass than the existing adjacent power station facility. The upper sections of the main building and the adjacent stacks (including plumes during certain climatic conditions) will be visible. However, there will be no change to the balance of the view. The impact will <u>be long term and reversible</u> .				
Magnitude of impact at operation			<u>Low</u>	
Significance of effect at operation	Hotel/ farmshop visitors		<u>Minor adverse</u> (not significant)	

VIEWPOINT 2: BRICKFIELD HOUSE, SOUTH MARSH RD				
Grid reference	Receptor type	Elevation (mAOD)	Distance from Site (km)	Direction of view
521293, 412788	Residential	8.7	1.75	North-east
CONSTRUCTION				
Visual susceptibility to change		Value of view		Sensitivity of receptor
View forms secondary focus for receptors at this location due to presence of a screening hedge and oblique views from windows. However, residential use means susceptibility is considered to be <u>high</u> .		Typical view with no recognised quality which contains a number of detractors. <u>Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at construction				
Views of ground level construction operations will be restricted by distant intervening vegetation and taller structures by a close proximity garden boundary beech hedge. As the tallest structures are constructed they will become more visible from the upper storey gable end window. Views from the rest of the property windows will be oblique. The balance of the view will not be affected by the Proposed Development. The impact of construction will be <u>short term and reversible</u> .				
Magnitude of impact at construction				<u>Low</u>
Significance of effect at construction	Residents			<u>Minor adverse (not significant)</u>
OPERATION				
Visual susceptibility to change at operation		Value of view		Sensitivity of receptor
There is no change to susceptibility at this assessment scenario. Therefore susceptibility is considered to be <u>high</u> .		Typical view with no recognised quality which contains a number of detractors. <u>Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at operation				
New structures will be observed to the left of the existing South Humber Bank Power Station and will extend the presence of industrial structures in the view. Although a dominant feature in terms of scale and mass the Proposed Development will be largely characteristic of the type of industry locally. The structures will be larger than those associated with the adjacent South Humber Bank Power Station although will not change the overall balance of the view. The upper sections of the proposed main building, stacks and plumes (during certain climatic conditions) will be visible. Views will be oblique from an upper storey gable end window and from within the property boundary. The impact will be <u>long term and reversible</u> .				
Magnitude of impact at operation				<u>Low</u>
Significance of effect at operation	Residents			<u>Minor adverse (not significant)</u>

VIEWPOINT 3: CARR LANE PROW				
Grid reference	Receptor type	Elevation (mAOD)	Distance from Site (km)	Direction of view
521096, 412143	Footpath users	4.3	2.25	North-east
CONSTRUCTION				
Visual susceptibility to change		Value of view		Sensitivity of receptor
Construction operations form a secondary focus for receptors at this location due to presence of industrial views (which are characteristic of the area) and an intervening major road in close proximity. Susceptibility is considered to be <u>medium</u> .		Typical view with no recognised quality which contains a number of detractors. <u>Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at construction				
Views of ground level construction operations will be limited by the A180 road embankment and associated scattered trees. The main building and new stacks will appear behind and immediately adjacent South Humber Bank Power Station stacks and above intervening existing vegetation. As the tallest structures are constructed they will be viewed in the context of the existing South Humber Bank Power Station structures. The main building will be larger in scale and mass and will appear close to the left of the existing South Humber Bank Power Station, although there will be no change to the composition of the view. The impact of the construction phase will be <u>short term and reversible</u> .				
Magnitude of impact at construction				<u>Low</u>
Significance of effect at construction		Footpath users		<u>Minor adverse (not significant)</u>
OPERATION				
Visual susceptibility to change at operation		Value of view		Sensitivity of receptor
There is no change to susceptibility at this assessment scenario. Therefore susceptibility is considered to be <u>medium</u> .		Typical view with no recognised quality which contains a number of detractors. <u>Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at operation				
The Proposed Development will be observed behind and to the immediate left of the existing power station and will extend the presence of industrial structures in the view. The upper sections of the proposed main building, stacks and plumes (during certain climatic conditions) will be visible. The completed development will result in an increase to massing and size of structures within the view, within the context of the existing South Humber Bank Power Station structures, although there will be no change in the overall composition of the view. The impact will be <u>long term and reversible</u>				
Magnitude of impact at operation				<u>Low</u>
Significance of effect at operation		Footpath users		<u>Minor adverse (not significant)</u>

VIEWPOINT 4: CRESS COTTAGE				
Grid reference	Receptor type	Elevation (mAOD)	Distance from Site (km)	Direction of view
521902, 412050	Residential	1.4	1.65	North-east
CONSTRUCTION				
Visual susceptibility to change		Value of view		Sensitivity of receptor
Oblique or partially filtered views from residential receptor. Susceptibility is considered to be <u>high</u> .		View with no recognised quality which contains a number of detractors. <u>Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at construction				
Views of ground level construction operations will be limited by intervening vegetation. The construction of high level structures will appear behind and immediately adjacent South Humber Bank Power Station stacks and above intervening existing vegetation. As the tallest structures are constructed they will be viewed in the context of the existing South Humber Bank Power Station structures. The main building will be larger in scale and mass and will appear close to the left of the existing South Humber Bank Power Station, although there will be no change to the balance of the view. The impact of the construction phase will be <u>short term and reversible</u> .				
Magnitude of impact at construction				<u>Low</u>
Significance of effect at construction		Residential		<u>Minor adverse (not significant)</u>
OPERATION				
Visual susceptibility to change at operation		Value of view		Sensitivity of receptor
There is no change to susceptibility at this assessment scenario. Therefore susceptibility is considered to be <u>high</u> .		View with no recognised quality which contains a number of detractors. <u>Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at operation				
The upper sections of the proposed main building, stacks and plumes (during certain climatic conditions) will be visible although partially filtered by intervening vegetation. The completed development will result in an increase to massing and size of structures within the view, although within the context of the existing South Humber Bank Power Station structures. The operation of the Proposed Development will not result in a change to the overall balance of the view. The impact will be <u>long term and reversible</u> .				
Magnitude of impact at operation				<u>Low</u>
Significance of effect at operation		Residential		<u>Minor adverse (not significant)</u>

VIEWPOINT 5: BEECHWOOD FARM CARVERY				
Grid reference	Receptor type	Elevation (mAOD)	Distance from Site (km)	Direction of view
523357, 411478	Inn/ Restaurant	15.3	1.85	North
CONSTRUCTION				
Visual susceptibility to change		Value of view		Sensitivity of receptor
View forms secondary focus for receptors at this location. Therefore susceptibility is considered to be Medium.		View with no recognised quality and contains a number of detractors. <u>Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at construction				
Views of low level construction operations will be screened by the existing Lenzing Fibres buildings. Operations above this level will be clearly visible given the open and visually uncluttered foreground. Visible construction activities will appear to the right of the existing South Humber Bank Power Station. As the tallest structures are constructed they will be clearly viewed between existing chemical engineering infrastructure and existing South Humber Bank Power Station structures, resulting in a minor change to the composition of the view. The impact of the construction phase will be <u>short term and reversible</u> .				
Magnitude of impact at construction				<u>Low</u>
Significance of effect at construction	Visitors/ customers			<u>Minor adverse (not significant)</u>
OPERATION				
Visual susceptibility to change at operation		Value of view		Sensitivity of receptor
There is no change to susceptibility at this assessment scenario. Therefore susceptibility is considered to be <u>medium</u> .		View with no recognised quality and contains a number of detractors. <u>Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at operation				
The upper sections of the main building, stacks and plumes (during certain climatic conditions) associated with the Proposed Development will be clearly visible as a separate entity between existing large scale industrial infrastructure. The completed development will create an increase to massing and size of structures within the view, although would not result in an overall change to the composition of the view. The impact will be <u>long term and reversible</u> .				
Magnitude of impact at operation				<u>Low</u>
Significance of effect at operation	Visitors/Customers			<u>Minor adverse (not significant)</u>

VIEWPOINT 6: SUNK ISLAND FOOTPATH PROW				
Grid reference	Receptor type	Elevation (mAOD)	Distance from Site (km)	Direction of view
523506, 418861	Footpath users	13.8	5.3	South-west
CONSTRUCTION				
Visual susceptibility to change		Value of view		Sensitivity of receptor
View forms secondary focus for receptors at this location due to presence of alternative views and existing industrial skyline infrastructure. Therefore susceptibility is considered to be <u>medium</u> .		<u>Locally valued view with occasional visitors, detractors feature in distance. Medium</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at construction				
Long range views of construction activities will be barely discernible due to the distance from the viewpoint. Construction operations are likely to be visually insignificant within the existing industrial skyline. Long range views will be slightly affected by the change but there will be no impact on the characteristics of the view. The impact will be <u>short term and reversible</u> .				
Magnitude of impact at construction				<u>Very Low</u>
Significance of effect at construction		Footpath users		<u>Negligible adverse</u> (not significant)
OPERATION				
Visual susceptibility to change at operation		Value of view		Sensitivity of receptor
There is no change to susceptibility at this assessment scenario. Therefore susceptibility is considered to be <u>medium</u> .		<u>Locally valued view with occasional visitors, detractors feature in distance. Medium</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at operation				
Long range views of the Proposed Development will be barely discernible, to the immediate left of the existing South Humber Bank Power Station, due to the distance from the viewpoint. The Proposed Development will increase the scale and mass and extend the presence of power station structures, although there will be no changes to the overall characteristics of the view. However, the close proximity of the existing South Humber Bank Power Station means the Proposed Development is likely to be visually assimilated into the existing industrial skyline. The impact will be <u>long term and reversible</u> .				
Magnitude of impact at operation				<u>Very Low</u>
Significance of effect at operation		Footpath users		<u>Negligible adverse</u> (not significant)

VIEWPOINT 7: IMMINGHAM SOUTH, PROW				
Grid reference	Receptor type	Elevation (mAOD)	Distance from Site (km)	Direction of view
518577, 413771	Residents and footpath users	6.7	4.35	East-south-east
CONSTRUCTION				
Visual susceptibility to change		Value of view		Sensitivity of receptor
Construction operations form a secondary focus for receptors at this location due to presence of alternative industrial views which are characteristic of the area. The receptors at this location include the residential properties located on the southern periphery of Immingham and users of the PROW. Assessment is made for the more sensitive of the two groups – residents at the properties. Effects for PROW users of lesser sensitivity will be of lower magnitude. Given the presence of existing similar large scale industrial infrastructure, residential receptors although typically at the higher end of susceptibility are assessed as being of medium susceptibility to further views of similar activity. Therefore susceptibility is considered to be <u>medium</u> .		Typical view with occasional visitors, features a number of detractors. Low		Medium
Size/ scale, duration and reversibility of impact at construction				
Long range views of construction will be limited to upper level activities as a result of intervening vegetation. Visible construction activities will appear as a separate element to the left of the existing South Humber Bank Power Station. As the tallest structures are constructed they will be barely visible, viewed in the context of existing large scale structures and frequent power lines in the mid ground and distant skyline that will not change the overall balance of the view. The impact of the construction phase will be <u>short term and reversible</u> .				
Magnitude of impact at construction				Low
Significance of effect at construction		Residents and footpath users		Minor adverse (not significant)
OPERATION				
Visual susceptibility to change at operation		Value of view		Sensitivity of receptor
There is no change to susceptibility at this assessment scenario. Therefore susceptibility is considered to be <u>medium</u>		Typical view with occasional visitors, features a number of detractors. Low		Medium

Size/ scale, duration and reversibility of impact at operation		
The Proposed Development will be partially visible as a separate entity to the left of the existing South Humber Bank Power Station and will extend the presence of industrial structures. The Proposed Development, once completed, will create an increase to massing and size of structures within the view. However, views will be very distant and occupying a small element of wider panorama and will not alter the overall balance of the view. The upper sections of the stacks and plumes (during certain climatic conditions) associated with the Proposed Development will be clearly visible. The impact will <u>be long term and reversible</u> .		
Magnitude of impact at operation		<u>Low</u>
Significance of effect at operation	Residents and footpath users	Minor adverse (not significant)

VIEWPOINT 8: MAUXHALL FARM, PROW				
Grid reference	Receptor type	Elevation (mAOD)	Distance from Site (km)	Direction of view
519177, 413200	Residents and footpath users	3.6	3.75	East
CONSTRUCTION				
Visual susceptibility to change		Value of view		Sensitivity of receptor
View forms secondary focus for receptors at this location due to presence of intervening roadside vegetation, alternative views and other skyline detractors. The receptors at this location include the residential property at Mauxhall Farm and users of the PRow. Assessment is made for the more sensitive of the two groups – residents at the property. Effects for PRow users of lesser sensitivity will be of lower magnitude. Given the presence of existing similar large scale industrial infrastructure, residential receptors although typically at the higher end of susceptibility are assessed as being of <u>medium</u> susceptibility to further views of similar activity.		<u>Typical view with no recognised quality, features a number of detractors. Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at construction				
Views of construction will be limited to upper level activities as a result of intervening vegetation and ground levels. Visible construction activities will appear to the left of the existing South Humber Bank Power Station. As the tallest structures are constructed they will be viewed in the context of existing industrial structures and the adjacent power station and will not change the overall balance of the view. The impact of the construction phase will be <u>short term and reversible</u> .				
Magnitude of impact at construction				<u>Low</u>
Significance of effect at construction		Residents and footpath users		<u>Minor adverse (not significant)</u>
OPERATION				
Visual susceptibility to change at operation		Value of view		Sensitivity of receptor
There is no change to susceptibility at this assessment scenario. Therefore susceptibility is considered to be <u>medium</u>		<u>Typical view with no recognised quality, features a number of detractors. Low</u>		<u>Medium</u>

Size/ scale, duration and reversibility of impact at operation		
The Proposed Development will be partially visible as a separate entity to the immediate left of the existing South Humber Bank Power Station and will extend the presence of industrial structures. The Proposed Development, once completed, will create an increase to massing and size of structures within the view, which will not affect the overall composition of the view. The upper sections of the stacks and plumes (during certain climatic conditions) associated with the Proposed Development will be clearly visible. The impact will be long term and reversible.		
Magnitude of impact at operation		<u>Low</u>
Significance of effect at operation	Residents and footpath users	Minor adverse (not significant)

VIEWPOINT 9: MIDDLE DRAIN PROW				
Grid reference	Receptor type	Elevation (mAOD)	Distance from Site (km)	Direction of view
522276, 413642	Footpath users	5.0	0.65	South-east
CONSTRUCTION				
Visual susceptibility to change		Value of view		Sensitivity of receptor
Construction operations, for receptors at this location, will be viewed in the context of alternative industrial views, which are characteristic of the area. Therefore susceptibility is considered to be <u>medium</u> .		<u>Typical view with no recognised quality, features a number of detractors. Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at construction				
Close proximity views of most construction activities will be temporary and appear in the context and as an extension of the built form of the existing South Humber Bank Power Station to the immediate right. Views of construction activities will be readily apparent in the view. A waste management facility and chemical manufacture infrastructure are situated to the left. Intervening vegetation is not expected to screen views of the tallest structures. The impact of the construction phase will be <u>short term and reversible</u> .				
Magnitude of impact at construction				<u>Medium</u>
Significance of effect at construction	Footpath users			<u>Moderate adverse (significant)</u>
OPERATION				
Visual susceptibility to change at operation		Value of view		Sensitivity of receptor
There is no change to susceptibility at this assessment scenario. Therefore susceptibility is considered to be <u>medium</u> .		<u>Typical view with no recognised quality, contains a number of detractors. Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at operation				
Views of the Proposed Development will be direct and at close proximity. The new structures including main building and stacks (and associated plumes during certain climatic conditions) will be viewed in the context and as an extension of the built form of the existing South Humber Bank Power Station to the immediate right. Large infrastructure associated with a waste management facility and chemical manufacture infrastructure is situated to the left. The Proposed Development will increase the massing of structures that are visible, causing a change to the composition and balance of the view that will be readily apparent to the receptor. The impact will be <u>long term and reversible</u> .				
Magnitude of impact at operation				<u>Medium</u>
Significance of effect at operation	Footpath users			<u>Moderate adverse (significant)</u>

Sequential Views

- 11.6.21 Users of the main transport routes and the estuary footpath route will gain dynamic views towards the Proposed Development to varying degrees dependent on intervening structures, screening vegetation, elevation and direction of travel. Due to the height of the tallest structures within the Proposed Development (the stacks, with heights of 102 m AOD) these receptors will gain a wide variety of views, dependent upon the proximity to the Proposed Development, and direction of travel.
- 11.6.22 The A180 is orientated in a south-east to north-west direction, through mainly agricultural land, with road side vegetation often limiting views beyond the road corridor. The sensitivity of road users is considered to be low. Views of the Proposed Development will fall within side views and occasional oblique in the direction of the Proposed Development. Users of the local rail link travelling in both directions, will also gain views of the Proposed Development where not restricted by screening vegetation associated with the A180 to the north and trackside vegetation. As a result of distance, existing detractors and the dynamic nature of views, the magnitude of impact for construction and operation is considered to be low and the overall effects are considered to be negligible adverse (not significant).
- 11.6.23 The local roads within the Study Area that will gain views of the Proposed Development are located within and around settlements including land between settlements. Overall sensitivity is considered to be medium. Views of the Proposed Development from over 1.5 km away will either be restricted by intervening vegetation, major transport routes and built form locally or partially screened by the existing adjacent power station. In the operation scenario, views of the structures associated with the Proposed Development will be permanent and magnitude of impact is predicted to be low and the overall effect is considered to be minor adverse (not significant).
- 11.6.24 Views in closer proximity to the Proposed Development will be uninterrupted, from the north-west and south-east across open arable farmland. The receptors in these areas will be users of the local PRow and roads who are considered to have a high sensitivity given the close proximity. Views from the west through to the south will be partially obscured by the existing South Humber Bank Power Station and existing woodland planting to its road side perimeter. The magnitude of impact is therefore predicted to be medium at construction and operation. The overall effect is considered to be moderate adverse (significant).

Summary of Visual Effects

- 11.6.25 A summary of visual effects is provided in Table 11.10 below.

Table 11.10: Summary of effects on visual amenity

REF	VP LOCATION	RECEPTOR TYPE	SENSITIVITY OF RECEPTOR	MAGNITUDE OF IMPACT		SIGNIFICANCE OF EFFECT	
				CONSTRUCTION	OPERATION	CONSTRUCTION	OPERATION
1	Farm shop Hotel	Visitors/ Guests	Medium	Low	Low	Minor adverse (not significant)	Minor adverse (not significant)
2	Brickfield House	Residents	Medium	Low	Low	Minor adverse (not significant)	Minor adverse (not significant)
3	Carr Lane Footpath	Users of PRow	Medium	Low	Low	Minor adverse (not significant)	Minor adverse (not significant)
4	Cress Cottage	Residential	Medium	Low	Low	Minor adverse (not significant)	Minor adverse (not significant)
5	Beechwood Farm Carvery	Visitors/ Guests	Medium	Low	Low	Minor adverse (not significant)	Minor adverse (not significant)
6	Sunk Island Footpath	Users of PRow	Medium	Very Low	Very Low	Negligible adverse (not significant)	Negligible adverse (not significant)
7	Immingham South Footpath	Residents & users of PRow	Medium	Low	Low	Minor adverse (not significant)	Minor adverse (not significant)
8	Mauxhall Farm Footpath	Residents & users of PRow	Medium	Low	Low	Minor adverse (not significant)	Minor adverse (not significant)

REF	VP LOCATION	RECEPTOR TYPE	SENSITIVITY OF RECEPTOR	MAGNITUDE OF IMPACT		SIGNIFICANCE OF EFFECT	
				CONSTRUCTION	OPERATION	CONSTRUCTION	OPERATION
9	Middle Drain Footpath	Users of PRow	Medium	Medium	Medium	Moderate adverse (significant)	Moderate adverse (significant)

Landscape and Visual Impacts and Effects – Decommissioning

- 11.6.26 The impacts on landscape character and visual amenity, arising as a result of decommissioning of the Proposed Development are considered (using professional judgment) to be very similar to those identified at the construction stage of the Proposed Development.
- 11.6.27 For landscape this is as a result of: the scale and nature of the development in relation to the existing industrial structures; complexes present in close proximity and the wider landscape and current proposals for industrial developments in the locality.
- 11.6.28 For visual amenity this is as a result of the visibility of the decommissioning and demolition activities being similar or slightly less than construction due to the maturity of existing perimeter planting.
- 11.6.29 The predicted magnitudes of impact and classification of effects for decommissioning are expected to match those for construction. A separate assessment has therefore been considered unnecessary.
- 11.6.30 Visual impacts and effects for construction are described and summarised in Table 11.10.

Comparison of Proposed Development and Consented Development

- 11.6.31 The impacts and effects of the Proposed Development compared to a future baseline with the Consented Development are described below.

Construction

- 11.6.32 The predicted impacts as a result of the Proposed Development are similar to those that would be associated with the Consented Development. This is because the nature and overall scale of construction activity required for the Proposed Development (with the potential to impact on landscape character and visual amenity) would be similar to the activity required for the Consented Development.
- 11.6.33 As such, the construction of the Proposed Development is predicted to have no additional impact on landscape and visual receptors compared to a future baseline with the construction of the Consented Development.

Operation

- 11.6.34 The increase in traffic, and potential noise and light impacts at the Main Development Area associated with the Proposed Development will be the same as those associated with the Consented Development.
- 11.6.35 As such, the operation of the Proposed Development is predicted to have no additional landscape and visual impacts compared to a future baseline with the operation of the Consented Development.

Decommissioning

- 11.6.36 The nature and scale of decommissioning activities required for the Proposed Development would be the same as those required for the Consented Development, so the decommissioning of the Proposed Development is predicted to have no additional impact on landscape and visual receptors compared to a future baseline with the decommissioning of the Consented Development.

11.7 Mitigation and Enhancement Measures

11.7.1 Policy 42 in the 'North East Lincolnshire Local Plan 2013 to 2033' (NELC, 2018) states:

"Landscape character should be given due consideration in the nature, location, design and implementation of development proposals. Developers should:

- Complete a site specific landscape appraisal, proportionate to the anticipated scale and impact of a proposal, and submit a landscaping scheme for all development where this is appropriate, which complements the character and appearance of the Proposed Development responds to landscape character, climate change and flood alleviation where appropriate, and improves local biodiversity and levels of amenity;*
- Seek opportunities, when incorporating landscape buffers to offset development impacts, to enhance landscape quality including opportunities to incorporate suitable landscape planting;*
- Retain and protect trees and hedgerows which offer value for amenity, biodiversity and landscape; and*
- Take opportunities where appropriate, to retain, protect and restore elements that contribute to historic landscape character."*

11.7.2 No additional tree planting is proposed within the Proposed Development. However, the existing plantation to the north-west of the existing power station will be retained and will benefit from future maintenance and management to retain its existing screening and ecological function.

11.7.3 The design of bird habitat visual screen fencing will consider materials and colours that reflect the local landscape character.

11.7.4 Viewpoint 9 (Middle Drain footpath) is predicted to experience a moderate adverse (significant) visual effect during construction and this is expected to continue through the operational and decommissioning periods. No potential mitigation measures have been identified.

11.8 Limitations or Difficulties

11.8.1 Assessment of visual impact through the use of representative viewpoints has been restricted by the limits of public access. In particular, it has not been possible to visit viewpoints from overlooking boundaries of residential properties to accurately record the views available. In these instances, an estimation of the view has been made from visiting nearby public vantage points.

11.8.2 Views of the Proposed Development, other than those assessed, are acknowledged to exist. The viewpoints are not intended to provide an exhaustive or fully comprehensive catalogue of views of the Proposed Development; rather they provide a representative sample for the purpose of the landscape and visual impact assessment.

11.9 Residual Effects and Conclusions

11.9.1 The assessment has determined that the Proposed Development is likely to result in a moderate adverse (significant) visual effect on visual amenity from Viewpoint 9 (Middle Drain Footpath) during construction, operation and decommissioning as a result of the close distance and height of the proposed structures.

11.9.2 A summary of 'significant' landscape and visual effects is presented in Table 11.11.

Table 11.11: Summary of significant effects

DEVELOPMENT STAGE	ENVIRONMENTAL EFFECT (FOLLOWING DEVELOPMENT DESIGN AND IMPACT AVOIDANCE MEASURES)	CLASSIFICATION OF EFFECT PRIOR TO MITIGATION	MITIGATION/ ENHANCEMENT (IF IDENTIFIED)	CLASSIFICATION OF RESIDUAL EFFECT AFTER MITIGATION	NATURE OF EFFECT
<u>Construction</u>	Impact on visual amenity footpath users at Viewpoint 9 during construction activities	Moderate adverse (significant)	None	Moderate adverse (significant)	St/T/D
<u>Operation</u>	Impact on visual amenity footpath users at Viewpoint 9 during operation.	Moderate adverse (significant)	None	Moderate adverse (significant)	Lt/P/D
<u>Decommissioning</u>	Impact on visual amenity footpath users at Viewpoint 9 during demolition activities	Moderate adverse (significant)	None	Moderate adverse (significant)	St/T/D
<u>Nature of effect(s) key</u> Lt: Long term					

DEVELOPMENT STAGE	ENVIRONMENTAL EFFECT (FOLLOWING DEVELOPMENT DESIGN AND IMPACT AVOIDANCE MEASURES)	CLASSIFICATION OF EFFECT PRIOR TO MITIGATION	MITIGATION/ ENHANCEMENT (IF IDENTIFIED)	CLASSIFICATION OF RESIDUAL EFFECT AFTER MITIGATION	NATURE OF EFFECT
Mt: Medium term St: Short term P: Permanent T: Temporary D: Direct In: Indirect					

11.10 References

- Department for Energy and Climate Change (2011) *Overarching National Policy Statement for Energy EN-1 (July 2011)*.
- Department for Communities and Local Government (2019) *National Planning Policy Framework*.
- East Riding of Yorkshire Council (2018) *East Riding of Yorkshire Landscape Character Assessment*
- Estell Warren Landscape Architects for North Lincolnshire Council (1999) *Countryside Design Summary*
- Institute of Environmental Management and Assessment (2011) *The state of environmental impact assessment practice in the UK*
- Landscape Institute and Institute of Environmental Management and Assessment (2013) *Guidelines for Landscape and Visual Impact Assessment Third Edition*.
- Landscape Institute (2011) *Advice Note 01/11 Photography and photomontage in landscape and visual impact assessment*.
- Landscape Institute (2017) *Technical Guidance Note 02/17 Visual representation of development proposals*.
- Natural England (2013a) *NCA Profile 41: Humber Estuary (NE344)*
- Natural England (2013b) *NCA Profile 42: Lincolnshire Coast and Marshes (NE521)*
- Natural England (2014) *An Approach to Landscape Character Assessment*.
- North Lincolnshire Council (1999) *North Lincolnshire Landscape Character Assessment & Guidelines*
- North East Lincolnshire Council (2015) *Landscape Character Assessment, Sensitivity and Capacity Study*
- North East Lincolnshire Council (2018) *North East Lincolnshire Local Plan 2013 to 2033 (Adopted 2018)*

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12.0 GEOLOGY, HYDROGEOLOGY AND LAND CONTAMINATION

12.1 Introduction

- 12.1.1 This chapter of the Preliminary Environmental Information (PEI) Report identifies and addresses the potential impacts and effects of the construction, operation (including maintenance) and decommissioning of the Proposed Development on ground conditions and land quality. It should be read with reference to the description of the Proposed Development in Chapter 4.
- 12.1.2 The assessment has been prepared in accordance with the methodology described in Section 12.3 and is largely based on the information obtained following the completion of the Phase 1 Geo-environmental and Geotechnical Desk Study report provided in Appendix 12A in PEI Report Volume III.

12.2 Legislation and Planning Policy Context

- 12.2.1 The European Union (EU) Directives and United Kingdom (UK) Acts considered the key legislative drivers for the geology, hydrogeology and land contamination assessment, including risks to human health and the environment from ground conditions, are summarised in the following paragraphs.

The Building Act 1984 and The Building Regulations & c (Amendment) Regulations 2015

- 12.2.2 The Building Act 1984 and in particular the associated Building Regulations &c. (Amendment) Regulations 2015 are key when considering structural and design aspects of a development in terms of the geotechnical properties of the ground. The Building Act 1984 requires that buildings are constructed so that ground movement caused by swelling, shrinkage, freezing, landslip or subsidence of the sub-soils will not impair the stability of any part of the building.

The Environmental Protection Act 1990 (EPA) Part 2A - the Contaminated Land Regime

- 12.2.3 Current legislation relating to contaminated land in the UK is contained within Part 2A of the EPA, which was inserted by Section 57 of the Environment Act 1995 and by Section 86 of the Water Act 2003 (see below), and implemented by the Contaminated Land (England) Regulations 2006 [S.I. 2006/1380] (amended 2012 [S.I. 2012/263]). Under Part 2A, sites are identified as 'contaminated land' if they are (i) causing harm; (ii) if there is a significant possibility of significant harm; or (iii) if the site is causing, or could cause, pollution of controlled waters (i.e. both surface and groundwater).

The Water Resources Act 1991

- 12.2.4 The Water Resources Act 1991 provides statutory protection for controlled waters (i.e. streams, rivers, canals, marine environment and groundwater) and makes it an offence to discharge to controlled waters without the permission or consent of the regulators of these areas.

The Water Act 2003

- 12.2.5 The Water Act 2003 introduced a revision to the wording of the EPA, which requires that if a site is causing or could cause significant pollution of controlled waters, it may be determined as contaminated land. Once a site is determined to be contaminated land then remediation is required to render significant pollutant linkages insignificant (i.e. the source-pathway-receptor relationships that are associated with significant harm to human health and/ or significant pollution of controlled waters), subject to a test of reasonableness.

Other Legislation

12.2.6 Other legislation of relevance to this Chapter includes:

- Anti-Pollution Works Regulations 1999;
- Environmental Damage (Prevention and Remediation) (England) (Amendment) Regulations 2017;
- The Contaminated Land (England) (Amendment) Regulations 2012;
- The Control of Asbestos Regulations (2012);
- Environmental Permitting (England and Wales) Amendment (No 2) Regulations 2018;
- Hazardous Waste (England and Wales) (Amendment) Regulations 2016;
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017;
- The Waste Enforcement (England and Wales) Regulations 2018;
- The Water Framework Directive (2000/60/EC);
- The Groundwater Directive (2006/118/EC);
- The Environmental Quality Standards (EQS) Directive (2008/105/EC); and
- The Environmental Liability Directive (2004/35/EC).

Guidance on Assessment of Contaminated Land

12.2.7 Contaminated land, as defined in Part 2A of the EPA, is assessed through the identification and assessment of pollutant linkages (contaminant-pathway-receptor relationships). Implicit in EPA 1990: Part 2A Contaminated Land Statutory Guidance (Department for Environment, Food and Rural Affairs (Defra), 2012) is the application of risk assessment to assess whether potential pollutant linkages may be significant.

12.2.8 The risk-based methodology adopted in this report is based upon the Environment Agency's Model Procedures for the Management of Land Contamination (CLR11) (Environment Agency, 2004) together with the supporting guidance referenced within CLR11 and the revised guidance from the Environment Agency 'Land Contamination: Risk Management' (2019) (<https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks>). The methodology relies on the development of a site specific Conceptual Site Model (CSM) consisting of three components:

- a source of contamination: for example due to historical site operations;
- a pathway: a route by which receptors can become exposed to contaminants (examples include vapour inhalation, soil ingestion and groundwater migration); and
- a receptor: a target that may be exposed to contaminants via the identified pathways (examples include human occupiers/ users of the site, surface water, groundwater, property or ecosystems).

12.2.9 For a potential risk to either environmental and/ or human health receptors to exist, a plausible pollutant linkage involving each of these components must exist. If one of the components is absent then a pollutant linkage, and thereby potentially unacceptable risk, is also unlikely to exist. Where all three components are or may be present, a potentially complete pollutant linkage can be considered to exist. This does not automatically imply the presence of unacceptable risk but further investigation of the potential pollutant linkages is required.

Planning Policy Context – National Policy Statements

12.2.10 The Overarching National Policy Statement (NPS) for Energy (EN-1) Section 4.10 (Pollution control and other environmental regulatory regimes) (Department for Energy and Climate Change, 2011a) details that issues relating to discharges or emissions from a proposed project which may affect air quality, land quality and the marine environment, or which include noise and vibration may be subject to separate regulation under the pollution control framework or other consenting and licensing regimes. Before consenting any potentially polluting developments it should be confirmed that:

- the relevant pollution control authority is satisfied that potential releases can be adequately regulated under the pollution control framework; and
- the effects of existing sources of pollution in and around the site are not such that the cumulative effects of pollution when the proposed development is added would make that development unacceptable, particularly in relation to statutory environmental quality limits.

12.2.11 Section 5.3 of EN-1 (Biodiversity and geological conservation) states that:

“where the development is subject to EIA the applicant should ensure that the ES clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity”

12.2.12 Section 5.15 of EN-1 (Water Quality and resources) states that:

“where the project is likely to have effects on the water environment, the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment as part of the ES or equivalent. The ES should in particular describe:

- *the existing quality of waters affected by the proposed project and the impacts of the proposed project on water quality, noting any relevant existing discharges, proposed new discharges and proposed changes to discharges;*
- *existing water resources affected by the proposed project and the impacts of the proposed project on water resources, noting any relevant existing abstraction rates, proposed new abstraction rates and proposed changes to abstraction rates (including any impact on or use of mains supplies and reference to Catchment Abstraction Management Strategies);*
- *existing physical characteristics of the water environment (including quantity and dynamics of flow) affected by the proposed project and any impact of physical modifications to these characteristics; and*
- *any impacts of the proposed project on water bodies or protected areas under the Water Framework Directive and source protection zones (SPZs) around potable groundwater abstractions.”*

12.2.13 Other planning policy of relevance to the geology, hydrogeology and land contamination assessment is provided in Tables 12.1 and 12.2.

Table 12.1: The National Planning Policy Framework (Ministry for Housing, Communities and Local Government, 2019)

POLICY REFERENCE	SUMMARY
Paragraph 117	Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land.
Paragraph 118 c)	Planning policies and decisions should give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land.
Paragraph 170 a)	Planning policies and decisions should contribute to and enhance the natural and local environment by: protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan).
Paragraph 170 e)	Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.
Paragraph 170 f)	...by...remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.
Paragraph 171	Plans should: distinguish between the hierarchy of international, national and locally designated sites; allocate land with the least environmental or amenity value, where consistent with other policies in this Framework.....
Paragraph 178 a)	Planning policies and decisions should ensure that: ...a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation)
Paragraph 178 b)	Planning policies and decisions should also ensure that:... after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990
Paragraph 178 c)	Planning policies and decisions should also ensure that... adequate site investigation information, prepared by a competent person, is presented.
Paragraph 179	Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.

POLICY REFERENCE	SUMMARY
Paragraph 180	Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.
Paragraph 183	The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.

Table 12.2: North East Lincolnshire Local Plan (North East Lincolnshire Council, 2018)

POLICY REFERENCE	SUMMARY
Policy 5 Paragraph 1	<p>Development Boundaries</p> <p>Development Boundaries are identified on the Policies Map. All development proposals located within or outside of the defined boundaries will be considered with regard to suitability and sustainability, having regard to:</p> <ul style="list-style-type: none"> • the quality of agricultural land; • measures to address any contamination of the site; and • impact on areas of heritage, landscape, biodiversity and geodiversity value, including open land that contributes to settlement character.
Policy 31 Paragraph 3	<p>Renewable and Low Carbon Infrastructure</p> <p>Proposals for renewable and low carbon energy generating systems will be supported where any significant adverse impacts are satisfactorily minimised and the residual harm is outweighed by the public benefits of the proposal. Developments and their associated infrastructure will be assessed on their merits and subject to the following impact considerations, taking account of individual and cumulative effect:</p> <ul style="list-style-type: none"> • biodiversity, geodiversity and nature conservation, with regard given to the findings of the site and project specific HRA and potential impacts on SPA birds where appropriate; • the land, including land stability, contamination, soils resources and loss of agricultural land.

12.3 Assessment Methodology and Significance Criteria

Baseline Conditions and Sensitive Receptors

- 12.3.1 This initial assessment of impacts to and from the existing ground conditions as a result of the Proposed Development has been undertaken using importance and significance criteria that have been developed and successfully applied to other Environmental Impact Assessments (EIAs). The methodology considers the potential presence of land and groundwater contamination as well as sites of geological/ geomorphological significance such as geological conservation features or mineral resources. Geotechnical constraints (e.g. differential settlement, subsidence and the potential for ground gas accumulation) are also discussed within this Chapter with the Proposed Development infrastructure identified as a receptor.
- 12.3.2 Information obtained from the following sources mentioned in Section 12.4 below have been used to establish the baseline conditions. The Conceptual Site Model (CSM) presented in the Phase 1 Geo-environmental and Geotechnical Desk Study Report within Appendix 12A in PEI Report Volume III, is integrated into the assessment of baseline conditions. All supporting information is consistent with the risk-based framework adopted in the Environment Agency guidance Land Contamination: Risk Management (2019) online at <https://www.gov.uk/guidance/land-contamination-how-to-manage-the-risks> and guidance document Model Procedures for the Management of Land Contamination - CLR11 (Environment Agency, 2004). Guidance within British Standard (BS) 10175: 2011+A2:2017 Investigation of Potentially Contaminated Sites – Code of Practice (British Standards Institute (BSI), 2017) has also been followed.
- 12.3.3 A ground investigation is currently being undertaken and will be reported in the final Environmental Statement.
- 12.3.4 The geology, hydrogeology and land contamination assessment initially entailed defining the importance/ sensitivity of identified receptors which takes into consideration the following:
- surrounding land uses, based on mapping, site visits and existing planning designations;
 - proposed end-use, based on the nature of the Proposed Development;
 - soil resource losses as associated with the Proposed Development;
 - construction activities that are necessary for the Proposed Development;
 - details of geological and/or nature conservation importance; and
 - geology, hydrogeology and hydrology of the Site and the Study Area (which is defined in Section 12.4).
- 12.3.5 Potential sources of contamination associated with the Site are identified considering the current and previous land use from study of existing reports, current and historic maps, photographs, local history sources, environmental database information and a Site inspection.
- 12.3.6 Where a significant contamination source has been identified and the sensitivity of receptors considered, then the potential effects can be determined by consideration of the pathways through which the source or hazard may affect the receptors. The magnitude of impact and the significance of effect is then determined taking due account of strength of pathway between a source and a receptor.

Assessment of Significance of Effects

- 12.3.7 This section describes the framework of the assessment in identifying the magnitude of impact, sensitivity of receptor, and classification of effect. The impact assessment methodology applied takes account of technical guidance that has been produced in the UK for the assessment of ground conditions and water resources by the government - the Environment Agency document Model Procedures for the Management of Land Contamination - CLR11 (Environment Agency, 2004), Contaminated land: Applications in Real Environments (CL:AIRE, 2010); and BS 10175: 2011 Investigation of Potentially Contaminated Sites – Code of Practice (BSI, 2011).
- 12.3.8 The effects are assessed in terms of the sensitivity or importance of a receptor or feature, and the magnitude of change or scale of impact due to the Proposed Development.
- 12.3.9 The sensitivity of a receptor reflects the quality of the receptor and its ability to absorb an impact without perceptible change. Sensitivity is defined in Table 12.3. The importance of potentially affected geological/ geomorphological features and the sensitivity of receptors that may be affected by land contamination impacts, have been assessed on this basis.

Table 12.3: Importance/ sensitivity criteria of geology, hydrogeology and land contamination resources/ receptors

SENSITIVITY/ VALUE OF RECEPTOR	RECEPTORS SUSCEPTIBLE TO LAND CONTAMINATION AND GROUND HAZARD IMPACTS	SOIL GEOLOGICAL AND HYDROGEOLOGICAL RESOURCES
Very High	Attribute has a high quality and rarity on a regional or national scale.	Principal Aquifer providing a regionally important resource. Groundwater supporting a site protected under European and UK habitat legislation. Groundwater Source Protection Zone (SPZ) 1.
High	Future site users (residential development). Residential areas or schools within 50 m of construction works. Water features deemed to be of high value. Ecological features deemed to be of high value. Allotments, arable farmland, livestock or market gardens on or adjacent to the site.	Principal Aquifer. Secondary A Aquifer providing locally important resource or supporting river ecosystem. Groundwater SPZ 2 or 3. Internationally and nationally designated sites. Regionally important sites with limited potential for substitution. High quality agricultural soils (Grade 1 and 2) or soils of high nature conservation or landscape importance. Presence of significant mineral reserves and within a Mineral Consultation Area. Soil/ materials disposal required following earthworks resulting in a significant increase in demand on waste management infrastructure.

SENSITIVITY/ VALUE OF RECEPTOR	RECEPTORS SUSCEPTIBLE TO LAND CONTAMINATION AND GROUND HAZARD IMPACTS	SOIL GEOLOGICAL AND HYDROGEOLOGICAL RESOURCES
Medium	<p>Future site users (commercial development). Residential areas or schools within 50 to 250 m of construction works. Commercial areas within 50 m of construction works.</p> <p>Water features deemed to be of medium value. Ecological features deemed to be of medium value.</p> <p>The built environment including buildings and infrastructure.</p>	<p>Secondary A and B Aquifers. Secondary A Aquifer providing source of water for agricultural or industrial use with limited connectivity with surface water features.</p> <p>Regionally important sites with potential for substitution. Locally designated sites with limited potential for substitution.</p> <p>Good quality agricultural soils (Grade 3a) or soils of medium conservation or landscape importance.</p> <p>Site within a Mineral Consultation Area.</p> <p>Soils/ materials disposal required following earthworks resulting in a moderate increase in demand on waste management infrastructure.</p>
Low	<p>Future site users (car park, highways and railway related development). Residential areas >250 m from construction works. Commercial areas within 50 to 250 m of construction works.</p> <p>Water features deemed to be of low value. Ecological features deemed to be of low value.</p>	<p>Secondary B Aquifers. Secondary B Aquifer providing source of water for agricultural or industrial use with limited connectivity with surface water features.</p> <p>Undesignated sites of some local earth heritage interest.</p> <p>Moderate or poor quality agricultural soils (Grade 3b or 4) or soils of low nature conservation or landscape importance.</p> <p>Limited potential for mineral reserves and site not within a Mineral Consultation Area.</p> <p>Soil/ materials disposal required following earthworks resulting in a minor increase in demand on waste management infrastructure.</p>
Very Low	<p>Attribute has a negligible quality or rarity on a local scale.</p> <p>Other sensitive receptors susceptible to soil or groundwater contamination.</p>	<p>Unproductive groundwater strata. No mineral extraction potential.</p> <p>No geological or geomorphological features of interest.</p> <p>No developed land uses other than transport infrastructure within 250 m.</p> <p>Surface water feature deemed to be of negligible quality/ value.</p>

Magnitude of Impacts

12.3.10 The magnitude of a potential impact considers the scale of the predicted change to the baseline condition taking into account its duration (i.e. the magnitude may be moderated by the impacts being temporary rather than permanent, short term rather than long term). Definitions for impact magnitude are described in Table 12.4. It is generally unlikely that impacts on geology, hydrogeology and land contamination due to new developments would be beneficial, so the examples of magnitude all relate to negative/ adverse impacts.

Table 12.4: Impact magnitude criteria (geology, hydrogeology and land contamination)

MAGNITUDE	DESCRIPTION	EXAMPLES
High	Total loss or major alteration to key features of the baseline conditions such that post development character/ composition of baseline condition will be fundamentally changed	Pollution of potable sources of water abstraction. Loss of, or extensive change to, an aquifer or groundwater supported designated wetland. Loss of, or extensive change to, nationally important geological/ geomorphological features.
Medium	Loss or alteration to one or more key features of the baseline conditions such that post development character/ composition of baseline condition will be materially changed.	Partial loss or change to an aquifer. Partial loss of the integrity of groundwater supported designated wetlands. Permanent loss of regionally important geological features or substantial changes to nationally important geological/ geomorphological features.
Low	Results in some measurable change in attributes quality or vulnerability compared to baseline conditions. Changes arising from the alteration will be detectable but not material; the underlying character/ composition of baseline condition will be similar to the pre-development situation.	Measurable effect on aquifer but of limited size or proportion, which does not lead to a reduction in the aquifer status. Minor effects on groundwater supported wetlands. Minor changes to regionally important geological/ geomorphological features or small changes to nationally important geological/ geomorphological features.
Very Low	Very little change from baseline conditions. Change is barely distinguishable, approximating to a 'no change' situation.	No measurable effect upon groundwater, or geology/ geomorphology.

Assessment of Significance of Effects

- 12.3.11 The classification and significance of a potential effect is derived from both the sensitivity of the feature and the magnitude of the impact, and can be then determined using the matrix presented in the Table 12.5. Effects can be beneficial, adverse or neutral and their significance major, moderate, minor or negligible.

Table 12.5: Classification of effects

MAGNITUDE OF IMPACT	SENSITIVITY OF RECEPTOR			
	High	Medium	Low	Very Low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very Low	Minor	Negligible	Negligible	Negligible

- 12.3.12 The EIA Regulations require the likely significant effects to be identified. Any effect predicted to be minor or negligible is considered to be not significant. Effects assessed as moderate or major are considered to be significant.

- 12.3.13 The classification of effect is further explained in Table 12.6.

Table 12.6: Explanation of significance classifications

CLASSIFICATION	GENERAL DESCRIPTION	SIGNIFICANT?
Major (adverse or beneficial)	<p>A large and/ or detrimental change to a valuable/ sensitive receptor; likely or apparent exceeding of accepted (often legal) threshold or a major departure from national targets. A large and beneficial change, resulting in improvements to baseline conditions whereby previously poor conditions are replaced by compliance with accepted (often legal) thresholds or a major contribution is made to national targets.</p> <p>These are effects which may represent key factors in the decision making process. Potentially associated with sites and features of national importance or likely to be important considerations at a regional or district scale. Major effects may relate to impacts on resources or features which are rare and cannot be relocated, or if lost, cannot be replaced.</p>	Yes

CLASSIFICATION	GENERAL DESCRIPTION	SIGNIFICANT?
Moderate (adverse or beneficial)	A medium scale change which, although not beyond an accepted (often legal) threshold, is still considered to be generally unacceptable, unless balanced out by other significant positive benefits of the development. Likely to relate to departure from relevant planning policy, rather than legal compliance. A positive moderate effect is a medium scale change that is significant in that the baseline conditions are improved to the extent that guideline targets are contributed to. These effects, if adverse, are likely to be important at a local or district scale and on their own could have a material influence on decision making.	Yes
Minor (adverse or beneficial)	A small change that, whilst adverse, does not exceed accepted thresholds, legal or guideline standards. Unlikely to be a departure from planning policy. A small positive change, but not one that is likely to be a key factor in the overall balance of issues. These effects may be raised as local issues but are typically unlikely to be critical in the decision making process.	No
Negligible (adverse or beneficial)	A very small change that is so small and unimportant that it is considered acceptable to disregard. Effects which are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error, these effects are unlikely to influence decision making, irrespective of other effects. unlikely to influence decision making, irrespective of other effects.	No

Assessment Scenarios and Parameters

12.3.14 As described in Chapter 4: The Proposed Development and Chapter 5: Construction Programme and Management, three possible construction programme scenarios have been identified. The assessment of impacts presented in this chapter is relevant to all three scenarios.

12.3.15 Maximum development parameters (the Rochdale Envelope) as set out in Chapter 4: The Proposed Development have been adopted to ensure a robust, worst case assessment.

Consultation

12.3.1 The EIA Scoping Opinion received from the Planning Inspectorate on 2nd October 2019 (see Appendix 1B in PEI Report Volume III) confirmed that an assessment of impacts on ground conditions (including ground waters and contamination) during construction, operation (including maintenance) and decommissioning should form part of the EIA. The consultation response by NELC to PINS explained that the EIA Scoping Report captured

the relevant information requested by NELC in the scoping opinion in respect of the Consented Development and that NELC have no further comments.

12.3.2 Table 12.7 below summarises the comments within the EIA Scoping Opinion that are relevant to this Chapter.

Table 12.7: Summary of EIA Scoping Opinion comments relevant to geology, hydrogeology and land contamination

COMMENT	WHERE ADDRESSED
Planning Inspectorate EIA Scoping Opinion	
Definition of the study area: The report should explain how the study area has been defined, how this relates to the zone of influence of the Proposed Development and why it is sufficient to address the extent of the impacts associated with the Proposed Development.	Refer to Section 12.4
Assessment of Land Contamination: It is noted that the assessment of potential impacts would follow the relevant statutory guidance and the Contaminated Land Report 11: Model Procedures for the Management of Land Contamination. The Applicant is advised to agree the approach to assessing land contamination with the EA.	Refer to Section 12.3 and Appendix 12A
Mitigation Measures: The Applicant is referred to the advice on mitigation provided in section 3 [paras 3.3.10 – 3.3.12] of the PINS Scoping Opinion Report. Mitigation measures relied upon should be explained in detail as should their likely efficacy.	Refer to Section 12.5 and 12.7
Environment Agency response on EIA Scoping	
The Environment Agency stated “the scope of work for the assessment of risks associated with land contamination does not change as a result of the revised proposals for the site – compared to those associated with the Consented Development. I can confirm that the applicant’s proposal to review and update the desk-based (Phase 1) assessment, where required, is appropriate.”	Refer to Appendix 12A
The EA recommend that the Applicant should: <ul style="list-style-type: none"> • follow the risk management framework provided in CLR11, Model Procedures for the Management of Land Contamination, when dealing with land affected by contamination; • refer to the Environment Agency Guiding principles for land contamination for the type of information that we required in order to assess risks to controlled waters from the site. The Local Authority can advise on risk to other receptors, such as human health; • consider using the National Quality Mark Scheme for Land Contamination Management which involves the use of competent persons to ensure that land contamination risks are appropriately managed; • refer to the contaminated land pages on GOV.UK for more information. 	Refer to Section 12.3

12.4 Baseline Conditions

- 12.4.1 Baseline conditions are set out in the Phase I Geo-environmental and Geotechnical Desk Study Report (Appendix 12A in PEI Report Volume III).

Study Area

- 12.4.2 The Study Area for the geology, hydrogeology and land contamination assessment is the boundary of the Site and up to 500 m from the Site boundary. Where necessary, the assessment of impacts will be extended outside the Study Area to include important off-Site features within the vicinity of the Site.
- 12.4.3 A 500 m Study Area is considered appropriate for the above topics and aligns with established industry practice for defining study areas for the geology, hydrogeology and land contamination topic in EIA.
- 12.4.4 Whilst the review of baseline conditions focuses on the geological and hydrogeological setting, it also considers the wider environment in terms of identifying potential receptors that could be impacted upon by any existing or resulting soil and/or groundwater contamination. There is therefore some reference made to hydrological and ecological features in this chapter. These are also discussed in more detail within Chapter 14: Water Resources, Flood Risk and Drainage and Chapter 10: Ecology and Nature Conservation.

Geology

- 12.4.5 The Proposed Development is not situated within any identified areas of Artificial Ground. However, the uneven surfaces of the Main Development Area and the presence of a mound noted during the Site walkover indicate the presence of Made Ground. The underlying geology comprises superficial deposits of Tidal Flat (Clay and Silt) normally a consolidated soft silty clay, with layers of sand, gravel and peat. The Tidal Flat deposits are underlain by Glacial Deposits of Devensian age. The bedrock geology underlying the Tidal Flats is the Flamborough Chalk Formation, described by the British Geological Survey (BGS) Lexicon (BGS 'GeoIndex Onshore' website accessed 25/09/2019) as being "*White, well-bedded, flint-free chalk with common marl seams (typically about one per metre). Common stylolitic surfaces and pyrite nodules.*"
- 12.4.6 No geological faults have been identified at the Site either on BGS 1:50,000 or 1:10,560 scale maps.
- 12.4.7 There are four BGS boreholes within 250 m of the Main Development Area; TA21SW119, TA21SW347, TA21SW346 and TA21SW345. In borehole TA21SW119, Made Ground was identified between ground level and 0.30 m below ground level (bgl) in borehole TA21SW119. From approximately 0.30 m bgl to 7.48 m bgl, the geology was described as mudflat intertidal channel comprising of layers of clayey silt and sandy silts. Underlying the mudflat intertidal channel to 9.00 m bgl (base of borehole) was low salt marsh which comprised of silty clay with peat, wood fragments, pebbly sandy silt with chalk pebbles. No groundwater strike was recorded. The three remaining boreholes recorded alluvium from ground level at depths of between 6.60 m and 9.30 m bgl. Underlying the alluvium glacial deposits was described comprising of layers of clay and sand to depths of 23.00 m bgl overlying the Flamborough Chalk. Groundwater was encountered in these three boreholes between depths of 9.70 m bgl and 11.40 m bgl.
- 12.4.8 The Site is not within an area affected by coal mining and there are no BGS Recorded Mineral Sites within the Study Area.

Hydrogeology

- 12.4.9 The superficial deposits within the Site are classified by the Environment Agency as an Unproductive Aquifer. The bedrock geology is designated as a Principal Aquifer, i.e.

exhibiting high permeability and/or provides a high level of water storage. Principal Aquifers may support water supply and/or river base flow on a strategic scale.

- 12.4.10 The Site is not located within a Groundwater Source Protection Zone and there are no groundwater abstractions within the Study Area.

Hydrology

- 12.4.11 To the east of the Site is the Humber Estuary. 'High Water Tide' mark is noted on the Ordnance Survey (OS) maps as approximately 175 m from the eastern boundary of the Main Development Area.
- 12.4.12 There is a system of drainage channels around the majority of the perimeter of the Site. The Oldfleet Drain is located approximately 140 m south of the Site boundary (at its closest point) and it connects to the Mawbridge Drain approximately 1 km south of the Site.
- 12.4.13 A large pond lies off-Site approximately 250 m south of the Site to the south of the Oldfleet Drain.
- 12.4.14 The Environment Agency Catchment Data Explorer (<https://environment.data.gov.uk/catchment-planning/> accessed online on 25/09/2019) indicates the north-eastern area of the Site is within the 'North Beck Drain' catchment area and the south-western area is within the 'Mawbridge Drain' catchment area. The chemical qualities of both catchments are classified as 'Good' in the 2016 classification, indicating the Water Framework Directive (WFD) objective has been met. The ecological qualities of both catchments are designated as 'Moderate' in the 2016 classification, with an objective of 'Good' classification set for 2027.
- 12.4.15 The Environment Agency's flood map for planning (accessed <https://flood-map-for-planning.service.gov.uk/> online on 25/09/2019) indicates that the Site is within Flood Zone 3. These are areas assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. The flood zone does not take into account the presence of flood defences in the area.
- 12.4.16 Water quality and flood risk as discussed further in Chapter 14: Water Resources, Flood Risk and Drainage.

Designated and Non-Designated Geology Sites

- 12.4.17 There are no geologically designated sites identified within the Study Area.

Site History

- 12.4.18 Historical mapping from 1887 until 1999 depicts the Site and the Study Area as agricultural fields with drainage channels, with the Humber Estuary lying to the east of the Site.
- 12.4.19 During the late 1990s the South Humber Bank Power Station (SHBPS) was built within the Site, to the west of the Main Development Area, with an attenuation lagoon (pond) in the south of the Main Development Area. By 2006 a pond is depicted on the historical mapping situated in the north-eastern corner of the Main Development Area. The attenuation lagoon and pond have recently been infilled in preparation for the construction of the Consented Development.
- 12.4.20 From 1965 until the 1980s the most significant changes were the development of works buildings on the south-eastern boundary of the Site with further development on the north-east corner of the Site boundary, appearing in 1968 and by 1978 further works had been developed on the outskirts of the north-eastern and eastern Site boundaries.

12.4.21 In 2006 an underground pipeline is depicted on the historical mapping, 270 m north from the eastern boundary of the Site which extends from the headland towards the sea.

Potentially Contaminative Land Uses

12.4.22 The SHBPS, which lies directly to the west of the Main Development Area, is considered as a potentially contaminative land use due to its use as an energy generation facility which will have included some storage of fuel and chemicals for use in the maintenance and operation of the facility.

12.4.23 No landfill sites or waste management facilities are listed within 250 m of the Site. One Permitted Waste Management Facility is located within 500 m of the Site – the NEWLINCS waste management facility, for which a Permit was issued in May 2012.

12.4.24 Just outside the Study Area there are:

- seven Licensed Waste Management Facilities located between 500 m and 1 km of the Site;
- one BGS Recorded Landfill Site located 825 m south-east of the Site; and
- four Historic Landfills listed between 500 m to 1 km south-east of the Site (Stallingborough Landfill located c. 750 m to the north-west and Landfills No2, No3 and No4 at Greatcoates Works located c. 800 m to the south-east of the Site).

Contemporary Trade Uses

12.4.25 Two active Contemporary Trade Uses are listed on Site: a waste disposal service and a power transmission service.

12.4.26 There are a further two entries within 250 m of the Site; one classified as a rubber and plastic products manufacturer, which is active, and the other a chemicals and allied products manufacturer which is listed as inactive.

12.4.27 Just outside the Study Area between 500 m and 1 km, there are two Contemporary Land Uses entries which are both active; one classified as a Recycling Centre and the other as a Gas Supplier.

Previous Ground Investigation

12.4.28 In 2006, Centrica commissioned a Site Protection and Monitoring Program for SHBPS, which included a ground investigation and installation of monitoring wells in the western part of the Site and a monitoring programme.

12.4.29 The intrusive ground investigation recorded variable thicknesses of Made Ground overlying superficial alluvial clay deposits comprising very soft or soft black to grey brown or dark grey clay with a slight organic reducing odour. The alluvial clay was observed as becoming very sandy at 4.0 m bgl along with groundwater seepages. During the ground investigation groundwater was encountered across the monitoring well network with resting groundwater elevations ranging from 9.88 mAD (above site datum) to 10.24 mAD. The ground investigation report inferred that groundwater flowed towards the south-east.

12.4.30 Analysis of the soils undertaken during the investigation indicated the presence of localised, trace concentrations of heavy fractions (C21 – C25) aromatic and aliphatic Total Petroleum Hydrocarbons (TPH) and Polycyclic Aromatic Hydrocarbons (PAH) at shallow depths. Groundwater chemical analysis results recorded TPH concentrations below the method detection limit and aqueous PAH concentrations of 0.129 µg/l and 0.29 µg/l. The ground investigation report noted that the groundwater pH and chloride concentrations suggested alkaline freshwater conditions beneath the Site, with no evidence of saline intrusion from the Humber Estuary.

12.4.31 Further ground investigation is being carried out at the Site in advance of the Consented Development's construction and this will be reported in the final Environmental Statement for the Proposed Development.

12.5 Development Design and Impact Avoidance

12.5.1 This section considers how potential environmental impacts have or will be avoided, prevented, reduced or offset through design and/ or management of the Proposed Development with respect to ground conditions and contamination.

12.5.2 As noted above a ground investigation is being undertaken to more accurately quantify potential hazards and a risk assessment carried out to define potential remediation objectives to narrow the degree of uncertainty in the risk rankings. The ground investigation comprised the following:

- investigation of the nature and extent of the Made Ground across the Main Development Area;
- investigation of the nature of the underlying natural strata, where present, including determination of in-situ soil properties; the natural bearing resistance of the overburden subsoil, porewater pressure, shear wave velocity, dynamic shear module and Poisson ratios;
- investigation of depths to rockhead;
- obtain soil and groundwater samples for chemical testing and geotechnical testing;
- install gas and groundwater monitoring wells and monitoring of ground gas concentrations and groundwater levels; and
- undertake a range of suitable soil, leachate and groundwater chemicals, including Building Research Establishment (BRE) sulphate tests.

12.5.3 A Construction Environmental Management Plan (CEMP) will be prepared and implemented by the selected construction contractor. This CEMP will include a range of measures associated with mitigating potential impacts associated with land contamination as detailed below. Such measures accord with legal compliance and best practice guidance when working with or around contaminated materials. A Framework CEMP is presented within Appendix 5A in PEI Report Volume III.

12.5.4 Before construction, a remediation strategy may be required which will be dependent on the findings of the ground investigation and the presence of contaminated soil or groundwater. If required, the strategy will set out how the earthworks/ excavation stage of the Proposed Development will be undertaken. Where necessary, the strategy will consider what materials, if any, can be reused and what materials are surplus and require either disposal or onward management to ensure appropriate re-use. The strategy will also define whether any treatment may be required, prior to reuse or disposal as well as establishing risk-based compliance criteria for soils to be screened against. The strategy will cover the clearing of the Site and the works required to prepare it for development.

12.5.5 A Materials Management Plan (MMP) will be prepared alongside the remediation strategy. The MMP will detail the procedures and measures that will be taken to classify, track, store, dispose of and possibly re-use all excavated materials that are expected to be encountered during the construction of the Proposed Development.

12.5.6 The disposal of soil waste, contaminated or otherwise to landfill sites will be best mitigated by minimisation of the overall quantities of waste generated during construction and by ensuring that excavated material consigned to landfill cannot, as an alternative, be put to use either on Site or on other sites (see Chapter 16: Waste Management).

- 12.5.7 The Flamborough Chalk formation is known to contain pyritic minerals. Therefore, upon completion of an additional ground investigation, chemical analysis of soil samples will be required to determine the appropriate design sulphate concrete classification to prevent chemical attack on concrete.

Construction Phase

Impacts on Soil Resources

- 12.5.8 The potential impacts on soil resources will be managed by minimising trafficking over topsoil materials and undertaking soil stripping during appropriate weather conditions, such that the soils are not wet. Once stripped the soils will be stored in soil bunds to an agreed height so that the materials own weight does not damage the structure of the soil. The topsoil will be reused in areas of landscaping within the Site or off-Site if it cannot be re-used on Site.

Impacts on Human Receptors

- 12.5.9 The potential impacts specific to construction workers during construction of the Proposed Development will be managed by adherence to the working practices in accordance with Construction Industry Research and Information Association (CIRIA) C741 Environmental Good Practice on Site 4th Edition (CIRIA, 2015), including:

- measures to minimise dust generation;
- provision of personal protective equipment (PPE), such as gloves, barrier cream, overalls etc. to minimise direct contact with soils;
- provision of adequate hygiene facilities and clean welfare facilities for all construction site workers;
- monitoring of confined spaces for potential ground gas accumulations, restricting access to confined spaces i.e. by suitably trained personnel, and use of specialist PPE, where necessary; and
- preparation and adoption of a Site and task specific health and safety plan.

Impact on Controlled Waters

- 12.5.10 To manage the potential impact on controlled waters, the pre-construction ground investigation for the Proposed Development will include installation of monitoring wells with targeted response zones, groundwater level monitoring and chemical testing to determine the presence of any contaminants in groundwater.
- 12.5.11 The management measures implemented through the CEMP will minimise the risk of any contaminated surface water runoff from the Site during the site preparation, earthworks and construction phase so that it does not have a detrimental effect on the receiving watercourse and the underlying aquifers. The surface water runoff will be controlled using appropriate drainage measures and segregating uncontaminated surface water from any process effluent streams, as well as impermeable surfacing to minimise infiltration into the ground. This will minimise the potential for potential contaminants to migrate to controlled waters.
- 12.5.12 If dewatering of the Site is required during the construction phase of the Proposed Development a permit from the Environment Agency to discharge to surface water or a consent to discharge to foul sewer will need to be obtained, and arrangements will need to be made to store any waters collected during dewatering to determine whether contamination is present before deciding on where to discharge the waters. Dewatering of an excavation may be undertaken without a permit subject to complying with conditions

set out in the Environment Agency Regulatory Position Statement 'Temporary dewatering from excavations to surface water' (2018).

12.5.13 A piled foundation is proposed for the Proposed Development. Therefore, a piling risk assessment will be undertaken in accordance with Environment Agency guidance. This will be used to establish the means of mitigating any risks of causing new pollutant linkages and/ or worsening existing ones with respect to risks to controlled waters at the construction stage of the Proposed Development.

12.5.14 In addition, the prevention of pollution of surface water and/ or groundwater will comply with the requirements of the following Environment Agency Pollution Prevention Guidelines (PPG) documents:

- PPG1 Basic Good Environmental Practices (2013);
- PPG5 Works in, near or over Watercourses (2014a);
- PPG6 Construction and Demolition Sites (2014b); and
- PPG21 Incident Response Planning (2009).

12.5.15 These PPG have been withdrawn and are currently being updated by the Environment Agency. However, they still provide good practice guidance to avoid pollution.

Impact on Development Infrastructure

12.5.16 Materials used in infrastructure will be designed and specified accordingly taking due account of the potential for aggressive ground conditions, if these are identified through the pre-construction ground investigation. The assessment methodology set out in BRE Special Digest 1 (2005) will be adopted to determine the appropriate concrete classification in relation to the protection of buried concrete against sulphate attack.

12.5.17 The design specification may include the import of engineered fill to improve the bearing capacity of the soil if required following ground investigation.

Operation Phase

Impact on Maintenance Workers

12.5.18 For maintenance workers during the operation phase, any maintenance works will be carried out in accordance with CIRIA (2015) C741 Environmental Good Practice on Site 4th Edition. Maintenance workers will be provided with appropriate PPE such as gloves and overalls to minimise direct contact with soils. Entry into excavations or confined spaces will comply with confined space legislation and assessed prior to entry. Should the detailed design of the Proposed Development incorporate any confined spaces such as ducts, manholes and inspection chambers, a gas monitoring programme and gas risk assessment will be undertaken in accordance with good practice guidance.

Impact on Off Site Receptors and Future Site Users

12.5.19 The risk to future Site users from direct contact with the underlying soils is considered very low. The Proposed Development will maintain an area of hardstanding across the majority of the Main Development Area, which will break the potential contaminant linkage and therefore reduce the likelihood of contact further.

12.5.20 The risk to future Site users from direct contact with contaminated leachate or groundwater is considered low. It is considered the probability that future Site users will come into contact with contaminated leachate or groundwater at the site is unlikely due to the majority of the area being covered by hardstanding.

Impact on Controlled Waters

- 12.5.21 The Proposed Development will include activities that are likely to generate contaminants that could pose risks to controlled waters if not managed. In addition there is potential for environmental risks associated with spillages due to road accidents or faulty vehicles. To manage potential impacts on controlled waters during the operational stage of the Proposed Development, suitable drainage systems will be employed during construction and maintained during operation to prevent infiltration of surface water or potential contaminants into the ground during the operation phase. The operator of the Proposed Development will comply with the requirements of any permits and/ or will handle and store materials such as chemicals and fuels as recommended by the manufacturer.

Impact on Development Infrastructure

- 12.5.22 In order to mitigate potential risks to sub-surface concrete structures from aggressive ground conditions associated with the presence of sulphate, the following options will be considered on a case by case basis:
- the specification of materials to be used for the construction of the Proposed Development will be specific to the ground conditions into which they will be placed;
 - the modification of concrete mix to resist sulphate attack;
 - bitumen coating of sub-surface structures; and
 - additional sacrificial thickness of sub-surface concrete.

- 12.5.23 The ground investigation will determine the suitable founding material which will be required across the Main Development Area. Any residual risks relating to soft ground will be addressed during the detailed design stage, taking into account the ground investigation results. The specification design can be determined following an additional ground investigation and chemical analysis of soil samples analysing the BRE Sulphate suite.

Decommissioning Phase (including demolition)*Impacts on Soil Resources*

- 12.5.24 During the decommissioning phase of the Proposed Development the potential impacts on soil resources will be managed by minimising trafficking over topsoil.

Impacts on Human Receptors

- 12.5.25 The potential impacts specific to demolition workers during the decommissioning phase of the Proposed Development will be mitigated by adherence to the working practices in accordance with CIRIA (2015) C741 Environmental Good Practice on Site 4th Edition (or the equivalent good practice guidance available at the time of decommissioning), including:
- measures to minimise dust generation;
 - provision of PPE such as gloves, barrier cream, overalls etc. to minimise direct contact with soils;
 - provision of adequate hygiene facilities and clean welfare facilities for all demolition workers;
 - monitoring of confined spaces for potential ground gas accumulations, restricting access to confined spaces i.e. by suitably trained personnel, and use of specialist PPE, where necessary; and
 - preparation and adoption of a site and task specific health and safety plan.

Impact on Controlled Waters

- 12.5.26 Mitigation measures similar to those employed for the construction phase of the Proposed Development will be implemented to minimise the risk of any contaminated surface water runoff from the Site during the decommissioning phase so that it does not have a detrimental effect on the receiving watercourse and the underlying aquifers. The surface water runoff will be controlled using appropriate drainage measures and segregating uncontaminated surface water from any process effluent streams, as well as impermeable surfacing to minimise infiltration into the ground. This will minimise the potential for potential contaminants to migrate to controlled waters.
- 12.5.27 If dewatering of the Site is required during the decommissioning phase of the Proposed Development a permit from the Environment Agency to discharge to surface water or a consent to discharge to foul sewer will need to be obtained, and arrangements will need to be made to store any waters collected during dewatering to determine whether contamination is present before deciding on where to discharge the waters. Dewatering of an excavation may be undertaken without a permit subject to complying with conditions set out in the Environment Agency Regulatory Position Statement 'Temporary dewatering from excavations to surface water' (2018).

12.6 Likely Impacts and Effects

- 12.6.1 The impacts and effects of the Proposed Development compared to a future baseline without the Consented Development are described below.

Conceptual Site Model (CSM)

- 12.6.2 The CSM defines the plausible contaminant source, pathway and receptor linkages, which is integral to defining the baseline conditions. The CSM presents potential sources of contamination, potential receptors and potential sources of contamination migration pathways that have been identified for the Proposed Development.
- 12.6.3 The topography, geology, hydrogeology and hydrology of the Site are the main factors that influence the way in which potential contaminants in the soil or groundwater can be transported on or off Site, and the ways in which contamination can affect different receptors. Potential receptors are first summarised in this section, and where applicable references are made to the other relevant chapters within the PEIR. Potential sources and pathways linking any sources to the defined receptors are then identified.

Table 12.8: Sources of potential contamination for the Main Development Area (including a 250 m buffer).

POTENTIAL SOURCE	POTENTIAL PATHWAY	POTENTIAL RECEPTOR
Diffuse metal, inorganic and organic contamination within the Made Ground at the Site and from off Site sources (if present).	Ingestion of contaminated soil Inhalation/ ingestion of soil derived dust Inhalation of organic vapours. Direct contact with soils/ dusts	Future Site users Construction/ maintenance workers Development infrastructure Flora and fauna Off Site receptors
Asbestos containing materials (ACM) within the Made Ground (if present)	Inhalation of soil derived dust Direct contact with soils/ dusts	Future Site users Construction/ maintenance workers Off Site receptors

POTENTIAL SOURCE	POTENTIAL PATHWAY	POTENTIAL RECEPTOR
Generated leachate from Made Ground and spills/ leaks into natural ground (if present)	Leaching into groundwater and migration to surface watercourses Plant uptake	Surface watercourses Perched groundwater Off Site flora and fauna
Contaminants in groundwater (e.g. from on or off Site spills and leaks) (if present)	Migration and diffusion	Middle Drain and Oldfleet Drain Shallow groundwater (in Principal Aquifer)
Ground gases (if present)	Migration and diffusion via permeable strata	Future Site users Construction/ maintenance workers Flora and fauna Development infrastructure Off Site receptors

12.6.4 The assessment considers the potential impacts upon identified receptors prior to design and impact avoidance measures (initial classification). The residual effects when the embedded mitigation and good practice guidance as outlined in Section 12.5 are included are described in Section 12.9.

12.6.5 The following assessment is based on the methodology set out in Section 12.3. The assessment considers the impacts of the construction, operation (including maintenance) and decommissioning of the Proposed Development on identified receptors.

Construction Phase

Table 12.9: Summary of impacts and effects during construction phase (in the absence of development design and impact avoidance measures)

SOURCE	DESCRIPTION OF RESOURCE/ RECEPTOR AND IMPACT	SENSITIVITY/ IMPORTANCE OF RESOURCE/ RECEPTOR	MAGNITUDE OF IMPACT	INITIAL CLASSIFICATION OF EFFECT
Soil resource	Topsoil: loss/ deterioration of soil resource	Medium	Low	Minor adverse (not significant)
Made Ground and soil derived leachate	Construction workers: exposure to contaminants, dust and vapours	High	Very low	Minor adverse (not significant)

SOURCE	DESCRIPTION OF RESOURCE/ RECEPTOR AND IMPACT	SENSITIVITY/ IMPORTANCE OF RESOURCE/ RECEPTOR	MAGNITUDE OF IMPACT	INITIAL CLASSIFICATION OF EFFECT
	Controlled waters (surface water): reduction in groundwater/ surface water quality due to uncontrolled release of pollutants	High	Low	Moderate adverse (significant)
	Controlled waters (groundwater): migration of contaminated water through preferential pathways (such as piling) to groundwater in underlying aquifer.	High	Low	Moderate adverse (significant)
	Development infrastructure: chemical attack on buried structures such as concrete; permeation of water pipes by contaminants.	Medium	Medium	Moderate adverse (significant)
	Off Site receptors: exposure to contaminants, dust and vapours.	Medium	Low	Minor adverse (not significant)
	Flora and fauna: migration of contaminants to ecological receptors	Medium	Medium	Moderate adverse (significant)
Ground water	Controlled waters (surface water): migration to surface watercourses	High	Low	Moderate adverse (significant)

SOURCE	DESCRIPTION OF RESOURCE/ RECEPTOR AND IMPACT	SENSITIVITY/ IMPORTANCE OF RESOURCE/ RECEPTOR	MAGNITUDE OF IMPACT	INITIAL CLASSIFICATION OF EFFECT
	Controlled waters: lateral migration through aquifer	High	Low	Moderate adverse (significant)
	Off Site receptors: migration of groundwater vapours	Medium	Low	Minor adverse (not significant)
Ground gas	Construction workers: accumulation of ground gas in confined spaces – asphyxiation and explosion risks	High	Medium	Major adverse (significant)
	Development infrastructure: explosion risk	Medium	Low	Minor adverse (not significant)
	Off Site receptors: ground gas migration caused by ground disturbance during construction works	Medium	Low	Minor adverse (not significant)
Ground instability	Development infrastructure (e.g. settlement):	Medium	Low	Minor adverse (not significant)

Impacts on Soil Resources

- 12.6.6 During construction of the Proposed Development topsoil will be stripped and stored on Site. On completion of construction, stored topsoil will be re-used where possible in on Site landscaping. Any excess topsoil may need to be removed from Site for re-use elsewhere but it is expected that it will be retained and reused beneficially on Site.
- 12.6.7 The sensitivity of the soil on the Site is considered to be medium and the magnitude of the impact is considered to be low. The effect to soil resources is therefore considered to be minor adverse (not significant).

Impacts on Construction Workers

- 12.6.8 During the construction phase of the Proposed Development, the construction workers are potentially at risk of short term exposure to potential contaminants in Made Ground via dermal, inhalation and ingestion pathways. Asbestos could be encountered during the construction phase although none has been identified in previous ground

investigations. Chemical testing of soils undertaken in the previous investigations (see Section 12.4 Baseline Conditions (Previous Ground Investigation)) indicated the presence of localised, trace concentrations of heavy fractions ($C_{21} - C_{25}$) aromatic and aliphatic TPH and PAH.

- 12.6.9 During the construction phase of the Proposed Development, the use of heavy equipment and activities such as excavation, backfilling and compaction may disturb the soil and mobilise potentially contaminated materials and asbestos containing materials if found to be present.
- 12.6.10 In addition construction workers may be exposed to ground gases when working in confined spaces from on-Site sources (e.g. Made Ground material) or via migration from off-Site sources (if their presence is confirmed by future ground investigation).
- 12.6.11 The sensitivity of construction workers has been classed as high but as the magnitude of the impact is generally very low the effect on construction workers during the construction phase of the Proposed Development is considered to be minor adverse (not significant). Workers in confined spaces are at risk of asphyxiation and explosion due to accumulations of ground gas (if present). For workers in confined spaces the construction effect is major adverse (significant) without mitigation if ground gases are present.

Impacts on Controlled Waters

- 12.6.12 The groundwater underlying the Site is considered to be of high sensitivity. The superficial Tidal Flat Deposits are designated by the Environment Agency as an Unproductive Aquifer with the Flamborough Chalk designated as a Principal Aquifer. The Tidal Flat Deposits may provide some protection to the underlying Principal Aquifer, limiting migration of contaminants from the surface.
- 12.6.13 No groundwater abstractions have been identified within the Study Area and the Site is not located within a Groundwater Source Protection Zone.
- 12.6.14 Due to shallow groundwater depths recorded during the previous ground investigation in 2006, dewatering of excavations for the Proposed Development may be required during the construction phase. Storage and disposal of the water will comply with current regulations. The findings of the pre-construction ground investigation will confirm whether dewatering is required.
- 12.6.15 The main surface water features which may be impacted by the Proposed Development are:
- the Humber Estuary approximately 175 m east of the Proposed Development;
 - drainage ditches around the majority of the perimeter of the Site;
 - a new attenuation pond which will be constructed within the Main Development Area and a new ecological mitigation pond which will be constructed to the west of the SHBPS.
- 12.6.16 The sensitivity of surface water resources is classed as high and the magnitude is low. The sensitivity of groundwater resources is classed as high and the magnitude low. Therefore the effects on controlled waters during the construction phase of the Proposed Development are considered to be moderate adverse (significant) in relation to surface waters and groundwater, in the absence of mitigation measures.

Impacts on Development Infrastructure

- 12.6.17 Development and building infrastructure can be impacted upon by the ground conditions. Where adequate mitigation is not incorporated during the design and construction of a development, the impacts could be realised during the operational phase.
- 12.6.18 It is recommended that the specification of materials to be used during construction of a development are specific to the ground conditions into which they will be placed. For example, in the case of the Proposed Development, there is potential for aggressive ground conditions to be present, which can cause damage to concrete. If ground investigation finds that ground gas concentrations are elevated then these could present a risk of asphyxiation or explosion if allowed to accumulate in confined spaces without adequate mitigation. As such, appropriate mitigation will be incorporated during construction of the Proposed Development following suitable ground investigation.
- 12.6.19 The sensitivity of development infrastructure to the likely impacts has been classed as medium, with the magnitude being classed as low to medium. The effect on development infrastructure during the construction phase of the Proposed Development is considered to be minor adverse (not significant) to moderate adverse (significant), in the absence of mitigation measures.

Impacts on Off Site Receptors

- 12.6.20 The main off-Site human receptors are considered to be commercial/ industrial workers in the Study Area.
- 12.6.21 Workers and visitors to these areas are at risk from wind-blown dust and subsequent inhalation or direct contact with dusts of vapour generated by the construction activities associated with the Proposed Development.
- 12.6.22 The sensitivity of the receptors is medium and the magnitude of impact is low, and in the absence of mitigation measures, the effect on off Site receptors is considered to be minor adverse (not significant).

Impacts on Flora and Fauna

- 12.6.23 In the absence of mitigation, there is potential for impacts on flora and fauna in or adjacent to the Site due to uptake/ ingestion of water from the ground that is contaminated by spills/ leaks on Site or migration of contaminants from Made Ground. The sensitivity of receptors is low and the magnitude of impact is low, so the effect is considered to be negligible adverse (not significant) without mitigation.

Operation Phase

Table 12.10: Summary of impacts and effects during the operation phase (in the absence of development design and impact avoidance measures)

SOURCE	DESCRIPTION OF RESOURCE/ RECEPTOR AND IMPACT	SENSITIVITY/ IMPORTANCE OF RESOURCE/ RECEPTOR	MAGNITUDE OF IMPACT	INITIAL CLASSIFICATION OF EFFECT
Made Ground and soil derived leachate	Future Site users (workers and visitors): exposure to contaminants, dust and vapours	Medium	Low	Minor adverse (not significant)

SOURCE	DESCRIPTION OF RESOURCE/ RECEPTOR AND IMPACT	SENSITIVITY/ IMPORTANCE OF RESOURCE/ RECEPTOR	MAGNITUDE OF IMPACT	INITIAL CLASSIFICATION OF EFFECT
	Maintenance workers: exposure to contaminants, dust and vapours	High	Very low	Minor adverse (not significant)
	Controlled waters (surface water): reduction in groundwater / surface water quality due to uncontrolled release of pollutants	High	Low	Moderate adverse (significant)
	Controlled waters (groundwater): migration of contaminated water through preferential pathways (such as piled foundations) to groundwater in underlying aquifer.	High	Low	Moderate adverse (significant)
	Development infrastructure: chemical attack on buried structures such as concrete; permeation of water pipes by contaminants	Low	Medium	Minor adverse (not significant)
	Off Site receptors: exposure to contaminants, dust and vapours	Medium	Very low	Negligible adverse (not significant)
	Flora and fauna: migration of contaminants to other ecological receptors	Low	Low	Negligible adverse (not significant)

SOURCE	DESCRIPTION OF RESOURCE/ RECEPTOR AND IMPACT	SENSITIVITY/ IMPORTANCE OF RESOURCE/ RECEPTOR	MAGNITUDE OF IMPACT	INITIAL CLASSIFICATION OF EFFECT
Ground water	Controlled waters (surface water): migration to surface watercourses	High	Low	Moderate adverse (significant)
	Controlled waters: lateral migration through aquifer	High	Low	Moderate adverse (significant)
	Off Site receptors: migration of groundwater vapours	Medium	Very low	Negligible adverse (not significant)
Ground gas	Future Site users (Site workers and visitors): Accumulations of ground gas in confined spaces	Medium	Very low	Negligible adverse (not significant)
	Development infrastructure: explosion risk	Low	Low	Negligible adverse (not significant)
	Off Site receptors: migration of ground gas	Medium	Very low	Negligible adverse (not significant)
Ground instability	Development infrastructure (e.g. settlement)	Medium	Medium	Moderate adverse (significant)

Impacts on Future Site Users

- 12.6.24 It is considered that there is the potential for ground contamination to occur during operation of the Proposed Development (due to leaks or spillages for example) and for ground gas to accumulate in confined spaces that could pose risk to future Site users during the operational phase (if confirmed by future ground investigation).
- 12.6.25 The Main Development Area is proposed to be largely covered in one or more buildings and hardstanding, but areas of top-soiled landscaped land would be present around the margins of the Site.
- 12.6.26 Potentially hazardous materials (including those which represent a risk to controlled waters) will be stored in compliance with the requirements of any permits and/ or will handle and store such materials as recommended by the manufacturer.

- 12.6.27 Therefore, based on the proposed use of the Main Development Area the sensitivity of future Site users is classed as medium and the impacts are considered to have a low magnitude. The overall effect on future Site users during the operational phase of the Proposed Development is considered to be minor adverse (not significant) in relation to soil or groundwater contamination and ground gas.

Impacts on Future Maintenance Workers

- 12.6.28 Maintenance workers could be more directly exposed to soil or groundwater contaminants than future Site users (during excavation works for example). However, it is expected that the duration of exposure would be very short and that appropriate protective equipment and safe working procedures would be used.
- 12.6.29 Consequently the effect on maintenance workers during the operational phase of the Proposed Development is considered to be minor adverse (not significant).

Impacts on Controlled Waters

- 12.6.30 The Proposed Development will include activities during the operational phase that could generate contaminants that could pose risk to surface water (the Humber Estuary, drainage channels within the Site, the proposed ecological mitigation pond and the proposed attenuation lagoon) and/ or groundwater. The Main Development Area will be largely covered in hardstanding with other areas of top-soiled landscaping which will reduce infiltration potential. In addition, the operator of the Proposed Development will comply with the requirements of any permits and/ or will handle and store materials such as chemicals and fuels as recommended by the manufacturer. However, there could be potential for environmental risks associated with spillages due to road accidents or faulty vehicles.
- 12.6.31 The sensitivity of controlled waters during the operational phase of the Proposed Development has been classed as high for surface water and groundwater. The magnitude of the impacts to controlled waters is classed as low. Therefore the effect on controlled waters during the operational phase of the Proposed Development is considered to be moderate adverse (significant) in relation to soil and groundwater contamination, in the absence of mitigation measures.

Impacts on Development Infrastructure

- 12.6.32 Materials such as concrete, metals and plastic will be employed during the construction of the Proposed Development. These materials could be used underground or above ground level. Development/ building infrastructure can be impacted where materials have been incorrectly specified at the design/ construction stage. Buried concrete could be exposed to chemical attack especially from acidity associated with the presence of sulphate and this could compromise the structural integrity of the underground structures.
- 12.6.33 The sensitivity of the development infrastructure is considered low to medium. The magnitude of impact prior to the implementation of the mitigation measures is considered to be medium to low.
- 12.6.34 Therefore, the effect on development infrastructure during the operational phase of the Proposed Development is considered to be minor adverse (not significant) in relation to soil or groundwater contamination, negligible adverse (not significant) in relation to ground gas, and moderate adverse (significant) in relation to ground instability in the absence of mitigation measures.

Impacts on Off Site Receptors

- 12.6.35 The Proposed Development could potentially include activities during the operational phase that are likely to impact off Site receptors, for example fuel/ chemical spillages that could run off and infiltrate into the ground and surface water.
- 12.6.36 The sensitivity of the off Site receptors is considered to be medium. The magnitude of impact prior to the implementation of the mitigation measures is considered to be very low. Therefore the effect on off Site receptors during the operational phase of the Proposed Development is considered to be negligible adverse (not significant) for commercial/ industrial workers and visitors to the Proposed Development in relation to migration of soil or groundwater contamination.

Impacts on Flora and Fauna

- 12.6.37 The Proposed Development includes areas of landscaping around the margins of the Site. Whilst Site operations are not anticipated to be undertaken in the areas of landscaping, spillages could potentially occur and runoff into the areas of soft landscaping or to surrounding habitats and infiltrate into the ground.
- 12.6.38 The sensitivity of the flora and fauna is considered to be low. The magnitude of impact prior to the implementation of the mitigation measures is considered to be low. Therefore the effect on flora and fauna during the operational phase of the Proposed Development is considered to be negligible adverse (not significant) in relation to soil contamination.

Decommissioning Phase

Table 12.11: Summary of impacts and effects during the decommissioning phase (in the absence of development design and impact avoidance measures)

SOURCE	DESCRIPTION OF RESOURCE/ RECEPTOR AND IMPACT	SENSITIVITY/ IMPORTANCE OF RESOURCE/ RECEPTOR	MAGNITUDE OF IMPACT	INITIAL CLASSIFICATION OF EFFECT
Made Ground and soil derived leachate	Demolition workers: exposure to contaminants, dust and vapours	High	Very low	Minor adverse (not significant)
	Controlled waters (surface water): reduction in groundwater/ surface water quality due to uncontrolled release of pollutants	High	Low	Moderate adverse (significant)
	Controlled waters (groundwater): migration of contaminated water through preferential pathways to groundwater in underlying aquifer	High	Very low	Minor adverse (not significant)

SOURCE	DESCRIPTION OF RESOURCE/ RECEPTOR AND IMPACT	SENSITIVITY/ IMPORTANCE OF RESOURCE/ RECEPTOR	MAGNITUDE OF IMPACT	INITIAL CLASSIFICATION OF EFFECT
	Off Site receptors: exposure to contaminants, dust and vapours	Medium	Low	Minor adverse (not significant)
	Controlled waters (surface water): migration to surface watercourses	High	Low	Moderate adverse (significant)
Ground water	Controlled waters: lateral migration through aquifer	High	Low	Moderate adverse (significant)
	Off Site receptors: migration of groundwater vapours	Medium	Low	Minor adverse (not significant)
Ground gas	Off Site receptors: ground gas migration caused by ground disturbance during decommissioning works	Medium	Low	Minor adverse (not significant)

Impacts on Demolition Workers

- 12.6.39 During the decommissioning phase of the Proposed Development, the demolition workers are potentially at risk of short term acute exposure to potential contaminants in Made Ground via dermal, inhalation and ingestion pathways.
- 12.6.40 During the decommissioning phase of the Proposed Development, the use of heavy equipment and activities such as excavation, backfilling and compaction may disturb the soil and mobilise potentially contaminated materials if found to be present.
- 12.6.41 In addition demolition workers may be exposed to ground gases when decommissioning in confined spaces, from on Site sources (e.g. Made Ground material).
- 12.6.42 Whilst the sensitivity of construction workers has been classed as high, the magnitude of the impact is likely to be very low as mandatory PPE will be worn. Therefore, the effect on construction workers during the decommissioning phase of the Proposed Development is considered to be minor adverse (not significant).

Impacts on Controlled Waters

- 12.6.43 The groundwater underlying the Site is considered to be of high sensitivity. The superficial Tidal Flat Deposits are designated by the Environment Agency as an Unproductive Aquifer with the Flamborough Chalk designated as a Principal Aquifer. The Tidal Flat Deposits may provide some protection to the underlying Principal Aquifer, limiting migration of contaminants from the surface.

- 12.6.44 Should any dewatering of excavations for the Proposed Development be required during the decommissioning phase, storage and disposal of the water will comply with applicable regulations at that time.
- 12.6.45 The main surface water features which may be impacted by decommissioning of the Proposed Development are:
- the Humber Estuary approximately 175 m east of the Main Development area;
 - drainage channels around the majority of the perimeter of the Site;
 - the two surface water bodies within the Main Development Area (the new attenuation pond constructed within the Main Development Area and the new ecological mitigation pond constructed to the west of the South Humber Bank Power Station).
- 12.6.46 The sensitivity of surface water resources is classed as high and the magnitude is low. The sensitivity of groundwater resources is classed as high and the magnitude very low to low. Therefore, in the absence of mitigation, during the decommissioning phase of the Proposed Development, the effects on controlled waters are considered to be moderate adverse (significant) in relation to surface waters and minor adverse (not significant) to moderate adverse (significant) in relation to groundwater.

Impacts on Off Site Receptors

- 12.6.47 The main off Site human receptors are considered to be commercial/ industrial workers in the Study Area.
- 12.6.48 Workers and visitors to these areas are at risk from wind-blown dust and subsequent inhalation or direct contact with dusts of vapour generated by the decommissioning activities.
- 12.6.49 The sensitivity of the receptors is medium and the magnitude of impact is low. Therefore, the effect on off Site receptors is considered to be minor adverse (not significant).

Comparison of Proposed Development and Consented Development

- 12.6.1 The impacts and effects of the Proposed Development compared to a future baseline with the Consented Development are described below.

Construction

- 12.6.1 The potential for impacts during the construction phase of the Proposed Development which include the discovery of contaminated groundwater and soils during groundworks, contamination risks to soils and groundwater from leaks and spills, airborne contamination (dusts) and risks from presence of ground gases are the same as for the Consented Development. No additional impacts over and above those already identified for the Consented Development have been identified for the Proposed Development.
- 12.6.2 This is because the Main Development Area boundary, the type of construction activities, and the nature and locations of receptors will be the same for the Consented Development and Proposed Development.
- 12.6.3 As such, the construction of the Proposed Development is predicted to have no impact compared to a future baseline with the construction of the Consented Development.

Operation

- 12.6.4 There is no difference between the methods or scale of operation of the Consented Development and the Proposed Development in terms of the risks of contamination, so no additional impacts have been identified associated with the operation of the Proposed Development compared to the operation of the Consented Development. These include for example leaks, spills and contamination from storage of chemicals, fuels and wastes on

site affecting future Site users and groundwater, and the presence of gases, vapours and groundwater in the ground potentially affecting future Site users and buildings.

- 12.6.5 The same appropriate management methods will be applied for both the Consented Development and the Proposed Development e.g. housekeeping and preventative maintenance practices, such as appropriate storage of potentially contaminating liquid, as required by the Environmental Permit.
- 12.6.6 As such, the operation of the Proposed Development is predicted to have no additional impact compared to a future baseline with the operation of the Consented Development.

Decommissioning

- 12.6.7 The nature and scale of decommissioning activities required for the Proposed Development would be the same as those required for the Consented Development, so the decommissioning of the Proposed Development is predicted to have no impact compared to a future baseline with the decommissioning of the Consented Development.

12.7 Mitigation and Enhancement Measures

- 12.7.1 Mitigation measures for geology, hydrogeology and land contamination required for the Proposed Development are described in Section 12.5 Development Design and Impact Avoidance. Residual effects after these measures are adopted are set out in Section 12.9.

12.8 Limitations or Difficulties

- 12.8.1 This chapter relies on the information contained in previous desk study (AECOM, 2018) and the Site Protection and Monitoring Programme (SPMP) for South Humber Bank Power Station (RSK, 2007) and Site Protection and Monitoring Programme Review for South Humber Bank Power Station (Ford Consulting Group, 2011).
- 12.8.2 The results of the ground investigation currently being undertaken at the Site will augment the available data and will be reported in the final ES for the Proposed Development.

12.9 Residual Effects and Conclusions

- 12.9.1 Tables 12.12, 12.13 and 12.14 provide a summary of residual effects for the construction, operational and decommissioning phases of the Proposed Development following the implementation of the design and impact avoidance measures set out in Section 12.5. No likely significant residual effects are anticipated as a result of the Proposed Development.

Table 12.12: Summary of residual effects during construction phase following adoption of mitigation/ impact avoidance measures

SOURCE	DESCRIPTION OF RESOURCE/ RECEPTOR AND IMPACT	SENSITIVITY/ IMPORTANCE OF RESOURCE/ RECEPTOR	MAGNITUDE OF IMPACT	INITIAL CLASSIFICATION OF EFFECT	IMPACT AVOIDANCE MEASURES	RESIDUAL EFFECTS
Soil resource	Topsoil: loss/ deterioration of soil resource	Medium	Low	Minor adverse (not significant)	See Section 12.5	Minor adverse (not significant)
Made Ground and soil derived leachate	Construction workers: exposure to contaminants, dust and vapours	High	Very low	Minor adverse (not significant)	See Section 12.5	Negligible adverse (not significant)
	Controlled waters (surface water): reduction in groundwater/ surface water quality due to uncontrolled release of pollutants	High	Low	Moderate adverse (significant)	See Section 12.5	Negligible adverse (not significant)
	Controlled waters (groundwater): migration of contaminated water through preferential pathways (such as piling) to groundwater in underlying aquifer.	High	Low	Moderate adverse (significant)	See Section 12.5	Minor adverse (not significant)
	Development infrastructure: chemical attack on buried structures such as concrete; permeation of water pipes by contaminants.	Medium	Medium	Moderate adverse (significant)	See Section 12.5	Minor adverse (not significant)

SOURCE	DESCRIPTION OF RESOURCE/ RECEPTOR AND IMPACT	SENSITIVITY/ IMPORTANCE OF RESOURCE/ RECEPTOR	MAGNITUDE OF IMPACT	INITIAL CLASSIFICATION OF EFFECT	IMPACT AVOIDANCE MEASURES	RESIDUAL EFFECTS
	Off Site receptors: exposure to contaminants, dust and vapours.	Medium	Low	Minor adverse (not significant)	See Section 12.5	Negligible adverse (not significant)
	Flora and fauna: migration of contaminants to ecological receptors	Medium	Medium	Moderate adverse (significant)	See Section 12.5	Negligible adverse (not significant)
Groundwater	Controlled waters (surface water): migration to surface watercourses	High	Low	Moderate adverse (significant)	See Section 12.5	Negligible adverse (not significant)
	Controlled waters: lateral migration through aquifer	High	Low	Moderate adverse (significant)	See Section 12.5	Minor adverse (not significant)
	Off Site receptors: migration of groundwater vapours	Medium	Low	Minor adverse (not significant)	See Section 12.5	Negligible adverse (not significant)
Ground gas	Construction workers: accumulation of ground gas in confined spaces – asphyxiation and explosion risks	High	Medium	Major adverse (significant)	See Section 12.5	Negligible adverse (not significant)
	Development infrastructure: explosion risk	Medium	Low	Minor adverse (not significant)	See Section 12.5	Negligible adverse (not significant)
	Off Site receptors: ground gas migration caused by ground disturbance during construction works	Medium	Low	Minor adverse (not significant)	See Section 12.5	Negligible adverse (not significant)

SOURCE	DESCRIPTION OF RESOURCE/ RECEPTOR AND IMPACT	SENSITIVITY/ IMPORTANCE OF RESOURCE/ RECEPTOR	MAGNITUDE OF IMPACT	INITIAL CLASSIFICATION OF EFFECT	IMPACT AVOIDANCE MEASURES	RESIDUAL EFFECTS
Ground instability	Development infrastructure (e.g. settlement):	Medium	Low	Minor adverse (not significant)	See Section 12.5	Negligible adverse (not significant)

Table 12.13: Summary of residual effects during the operational phase following adoption of mitigation/ impact avoidance measures

SOURCE	DESCRIPTION OF RESOURCE / RECEPTOR AND IMPACT	SENSITIVITY/ IMPORTANCE OF RESOURCE/ RECEPTOR	MAGNITUDE OF IMPACT	INITIAL CLASSIFICATION OF EFFECT	IMPACT AVOIDANCE MEASURES	RESIDUAL EFFECTS
Made Ground and soil derived leachate	Future Site users (workers and visitors): exposure to contaminants, dust and vapours	Medium	Low	Minor adverse (not significant)	See Section 12.5	Negligible adverse (not significant)
	Maintenance workers: exposure to contaminants, dust and vapours	High	Very low	Minor adverse (not significant)	See Section 12.5	Negligible adverse (not significant)
	Controlled waters (surface water): reduction in surface water quality due to uncontrolled release of pollutants	High	Low	Moderate adverse (significant)	See Section 12.5	Negligible adverse (not significant)

SOURCE	DESCRIPTION OF RESOURCE / RECEPTOR AND IMPACT	SENSITIVITY/ IMPORTANCE OF RESOURCE/ RECEPTOR	MAGNITUDE OF IMPACT	INITIAL CLASSIFICATION OF EFFECT	IMPACT AVOIDANCE MEASURES	RESIDUAL EFFECTS
	Controlled waters (groundwater): migration of contaminated water through preferential pathways (such as piled foundations) to groundwater in underlying aquifer.	High	Low	Moderate adverse (significant)	See Section 12.5	Minor adverse (not significant)
	Development infrastructure: chemical attack on buried structures such as concrete; permeation of water pipes by contaminants	Low	Medium	Minor adverse (not significant)	See Section 12.5	Negligible adverse (not significant)
	Off Site receptors: exposure to contaminants, dust and vapours	Medium	Very low	Negligible adverse (not significant)	See Section 12.5	Negligible adverse (not significant)
	Flora and fauna: migration of contaminants to other ecological receptors	Low	Low	Negligible adverse (not significant)	See Section 12.5	Negligible adverse (not significant)
Groundwater	Controlled waters (surface water): migration to surface watercourses	High	Low	Moderate adverse (significant)	See Section 12.5	Negligible adverse (not significant)
	Controlled waters: lateral migration through aquifer	High	Low	Moderate adverse (significant)	See Section 12.5	Minor adverse (not significant)

SOURCE	DESCRIPTION OF RESOURCE / RECEPTOR AND IMPACT	SENSITIVITY/ IMPORTANCE OF RESOURCE/ RECEPTOR	MAGNITUDE OF IMPACT	INITIAL CLASSIFICATION OF EFFECT	IMPACT AVOIDANCE MEASURES	RESIDUAL EFFECTS
	Off Site receptors: migration of groundwater vapours	Medium	Very low	Negligible adverse (not significant)	See Section 12.5	Negligible adverse (not significant)
Ground gas	Future Site users (Site workers and visitors): accumulations of ground gas in confined spaces	Medium	Very low	Negligible adverse (not significant)	See Section 12.5	Negligible adverse (not significant)
	Development infrastructure: explosion risk	Low	Low	Negligible adverse (not significant)	See Section 12.5	Negligible adverse (not significant)
	Off Site receptors: migration of ground gas	Medium	Very low	Negligible adverse (not significant)	See Section 12.5	Negligible adverse (not significant)
Ground instability	Development infrastructure (e.g. settlement):	Medium	Medium	Moderate adverse (significant)	See Section 12.5	Negligible adverse (not significant)

Table 12.14: Summary of impacts and effects during the decommissioning phase following adoption of mitigation/ impact avoidance measures

SOURCE	DESCRIPTION OF RESOURCE/ RECEPTOR AND IMPACT	SENSITIVITY/ IMPORTANCE OF RESOURCE/ RECEPTOR	MAGNITUDE OF IMPACT	INITIAL CLASSIFICATION OF EFFECT	IMPACT AVOIDANCE MEASURES	RESIDUAL EFFECTS
Made Ground and soil derived leachate	Demolition workers: exposure to contaminants, dust and vapours	High	Very low	Minor adverse (not significant)	See Section 12.5	Negligible adverse (not significant)
	Controlled waters (surface water): reduction in ground water / surface water quality due to uncontrolled release of pollutants	High	Low	Moderate adverse (significant)	See Section 12.5	Negligible adverse (not significant)
	Controlled waters (groundwater): migration of contaminated water through preferential pathways to groundwater in underlying aquifer.	High	Very low	Minor adverse (not significant)	See Section 12.5	Negligible adverse (not significant)
	Off Site receptors: exposure to contaminants, dust and vapours.	Medium	Low	Minor adverse (not significant)	See Section 12.5	Negligible adverse (not significant)
	Controlled waters (surface water): migration to surface watercourses	High	Low	Moderate adverse (significant)	See Section 12.5	Negligible adverse (not significant)
Groundwater	Controlled waters: lateral migration through aquifer	High	Low	Moderate adverse (significant)	See Section 12.5	Negligible adverse (not significant)

SOURCE	DESCRIPTION OF RESOURCE/ RECEPTOR AND IMPACT	SENSITIVITY/ IMPORTANCE OF RESOURCE/ RECEPTOR	MAGNITUDE OF IMPACT	INITIAL CLASSIFICATION OF EFFECT	IMPACT AVOIDANCE MEASURES	RESIDUAL EFFECTS
	Off Site receptors: migration of groundwater vapours	Medium	Low	Minor adverse (not significant)	See Section 12.5	Negligible adverse (not significant)
Ground gas	Off Site receptors: ground gas migration caused by ground disturbance during de-commissioning works	Medium	Low	Minor adverse (not significant)	See Section 12.5	Negligible adverse (not significant)

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13.0 CULTURAL HERITAGE

13.1 Introduction

- 13.1.1 This chapter of the Preliminary Environmental Information (PEI) Report addresses the potential effects of the Proposed Development on cultural heritage. Cultural heritage in this context includes built heritage, the historic landscape, and any other elements that may contribute to the heritage of the area.
- 13.1.2 As outlined within the EIA Scoping Report (see Appendix 1A in PEI Report Volume III) no potential for significant effects on buried archaeology have been identified. The Site was stripped during the construction of the South Humber Bank Power Station (SHBPS) and appears to have been used as a laydown area and construction compound (refer to Plate 13B.4 in Appendix 13B in PEI Report Volume III). Any surviving remains will have been removed during this process and consequently there is no impact on archaeology. It is also considered that due to the nature of the Proposed Development and the previous extensive ground disturbance across the Site there will be no significant effect on any archaeological deposits outside of the Site boundary, for example due to changes in the water table. Further details in relation to drainage are presented in PEI Report Chapter 14: Water Resources, Flood Risk and Drainage.
- 13.1.3 As a result, this chapter does not include an assessment of the potential effects of the Proposed Development on archaeology, including above and below-ground archaeological resource.
- 13.1.4 This chapter is supported by Figure 13.1 in PEI Report Volume II and a gazetteer of the heritage assets included in Appendix 13A, in PEI Report Volume III.
- 13.1.5 Additional baseline information is also presented as Appendix 13B in PEI Report Volume III.

13.2 Legislation and Planning Policy Context

The Ancient Monuments and Archaeological Areas Act 1979

- 13.2.1 The Ancient Monuments and Archaeological Areas Act imposes a requirement for Scheduled Monument Consent for any works of demolition, repair, and alteration that might affect a scheduled monument. For non-designated archaeological assets, protection is afforded through the development management process as established both by the Town and Country Planning Act 1990 and the National Planning Policy Framework (NPPF 2018).

The Planning (Listed Buildings and Conservation Areas) Act 1990

- 13.2.2 The Planning (Listed Buildings and Conservation Areas) Act sets out the principal statutory provisions which must be considered in the determination of any application affecting either listed buildings or conservation areas.
- 13.2.3 Section 66 of the Planning (Listed Buildings and Conservation Areas) Act states that in considering whether to grant planning permission for development which affects a listed building or its setting, the local planning authority or, as the case may be, the Secretary of State shall have special regard to the desirability of preserving the building or its setting or any features of special architectural or historic interest which it possesses. By virtue of Section 1(5) of the Planning (Listed Buildings and Conservation Areas) Act a listed building includes any object or structure within its curtilage.
- 13.2.4 Section 72 of The Planning (Listed Building and Conservation Areas) Act 1990 established a general duty for a planning authority or the Secretary of State with respect

to any buildings or other land in a conservation area that special attention shall be paid to the desirability of preserving or enhancing the character or appearance of a conservation area.

- 13.2.5 Recent case law makes it clear that the duty imposed in the Planning (Listed Buildings and Conservation Areas) Act means that in considering whether to grant permission for development that may cause harm (substantial or less than substantial) to a designated asset (listed building or conservation area) or its setting, the decision maker should, in exercising the planning 'balance', give considerable importance and weight to the desirability of avoiding that harm.

National Planning Policy

Overarching National Policy Statement for Energy (EN-1)

- 13.2.6 Overarching National Policy Statement (NPS) for Energy (EN-1) (Department for Energy and Climate Change, 2011) recognises that the construction, operation and decommissioning of energy infrastructure has the potential to result in adverse impacts on the historic environment and sets out principles for assessing such impacts.
- 13.2.7 The NPS states that the historic environment results from the interaction between people and places through time, and includes all surviving physical remains of past human activity. NPS Paragraph 5.8.2 defines a heritage asset as an element of the historic environment that is of value to present and future generations because of its historic, archaeological, architectural or artistic interest. The sum of these interests is referred to as its significance.
- 13.2.8 NPS Paragraph 5.8.3 recognises that some heritage assets have a level of significance that warrants official designation, including World Heritage Sites, scheduled monuments, protected wreck sites, protected military remains, listed buildings, registered parks and gardens, registered battlefields and conservation areas. The NPS also recognises that there are non-designated heritage assets that are demonstrably of equivalent significance to scheduled monuments, and if the evidence suggests that such an asset may be affected by a proposed development, it should be considered subject to the policies for designated heritage assets (paragraph 5.8.5).
- 13.2.9 NPS Paragraph 5.8.6 states that impacts on other non-designated heritage assets should be considered on the basis of clear evidence that they have a heritage significance that merits such consideration, even though the assets are of lesser value than designated heritage assets.
- 13.2.10 NPS Paragraph 5.8.8 states that, as part of its assessment, the applicant should provide a description of the significance of the heritage assets affected by the development and the contribution of their setting to that significance. The level of detail should be proportionate to the importance of the heritage asset and no more than is sufficient to understand the potential effect on the heritage asset. As a minimum, the applicant should consult the relevant Historic Environment Record (HER) where details of previously recorded heritage assets and archaeological assessments are held.
- 13.2.11 Where a development site includes, or has the potential to include, heritage assets of archaeological interest, the applicant should carry out a desk-based assessment and if necessary, a field evaluation in order to properly assess the interest (NPS Paragraph 5.8.9). Ultimately, the applicant should ensure that the extent of the impact of the proposed development on the heritage assets can be adequately understood from the application and supporting documents (NPS Paragraph 5.8.10).
- 13.2.12 The NPS states that the significance and value of heritage assets should be taken into account when considering the impact of a proposed development. The desirability of

sustaining or enhancing the significance of heritage assets should also be taken into account, along with the desirability of new development making a positive contribution to the character and distinctiveness of the historic environment. NPS Paragraph 5.8.14 states there should be a presumption in favour of the conservation of designated heritage assets, and loss of significance to any designated heritage asset should require clear and convincing justification. Substantial harm to or loss of a Grade II listed building, park or garden should be exceptional. Substantial harm to or loss of designated assets of the highest significance, including scheduled monuments; registered battlefields; Grade I and II* listed buildings; Grade I and II* registered parks and gardens; and World Heritage Sites, should be wholly exceptional. Any harmful impact on the significance of a designated heritage asset should be weighed against the public benefit of the development (NPS Paragraph 5.8.15).

- 13.2.13 NPS Paragraph 5.8.20 recognises that where loss is justified, based on the merits of the development, the developer should be required to record and advance understanding of the heritage asset before it is lost. Where appropriate, such work will be carried out in accordance with a written scheme of investigation that has been agreed in writing with the local authority (NPS Paragraph 5.8.21).

National Planning Policy Framework (NPPF)

- 13.2.14 The National Planning Policy Framework (NPPF) (DCLG, 2019) sets out the Government's planning policies for England and how these should be applied to contribute to the achievement of sustainable development. The NPPF requires plans, both strategic and non-strategic to make provision for the conservation and enhancement of the built and historic environment (Paragraphs 20(d) and 28). Section 16 of the NPPF sets out a series of policies that are a material consideration to be taken into account in development management decisions.
- 13.2.15 Heritage assets are defined within the NPPF as "*A building, monument, site, place, area or landscape identified as having a degree of significance meriting consideration in planning decisions, because of its heritage interest*" (NPPF, Annex 2, Glossary). Heritage assets include those that are designated under legislation (such as listed buildings and scheduled monuments) as well as those that are non-designated. Non-designated heritage assets are assets that are considered to have a degree of local interest or significance usually recognised by local planning authorities either by their inclusion within the local HER or by local listing.
- 13.2.16 The NPPF sets out the importance of being able to assess the significance of heritage assets that may be affected by a development proposal. Significance is defined in Annex 2 as the value of a heritage asset to this and future generations because of its heritage interest. The interest may be archaeological, architectural, artistic or historic, and can extend to its setting. The setting of a heritage asset is defined in Annex 2 as "*the surroundings in which a heritage asset is experienced*". 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. The level of detail should be proportionate to the asset's importance and no more than is sufficient to understand the potential impact of the proposal on their significance (paragraph 189). Similarly, there is a requirement on local planning authorities to identify and assess the particular significance of any heritage asset that may be affected by a proposal; and that they should take this assessment into account when considering the impact of a proposal on a heritage asset (paragraph 190).
- 13.2.17 In determining planning applications, local planning authorities should take account of the following three points:

- the desirability of sustaining and enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation;
- the positive contribution that conservation of heritage assets can make to sustainable communities including their economic vitality; and
- the desirability of new development making a positive contribution to local character and distinctiveness (paragraph 192).

13.2.18 Paragraphs 193 to 196 of the NPPF recognise that heritage assets can be harmed or lost through alteration or destruction or development within their setting. This harm ranges from less than substantial through to substantial. With regard to designated assets, paragraph 193 states that great weight should be given to an asset's conservation, irrespective of the level of harm, and the more important the asset, the greater the weight should be. Paragraph 194 draws a distinction between those assets of exceptional interest (e.g. Grade I and Grade II* listed buildings, scheduled monuments¹), and those of special interest (e.g. Grade II listed buildings). Any harm or loss of heritage significance requires clear and convincing justification, and substantial harm or loss should be wholly exceptional with regard to those assets of greatest interest (paragraph 194).

13.2.19 In instances where development would cause substantial harm to or total loss of significance of a designated asset consent should be refused unless that harm or loss is 'necessary to achieve substantial public benefits that outweigh that harm or loss' (paragraph 195). In instances where development would cause less than substantial harm to the significance of a designated asset the harm should be weighed against the public benefits of the proposal including its optimum viable use (paragraph 196). In relation to non-designated assets a balanced judgment is required taking into account the scale of harm or loss and the significance of the asset (paragraph 197).

13.2.20 It should be noted that paragraph 199 of the NPPF says that the ability to record evidence of our past should not be a factor in deciding whether such loss should be permitted. Accordingly, whilst it is noted that there is potential to uncover remains of our past and generate records through the Proposed Development, the benefit or otherwise of this has not been considered as a factor that either mitigates or reduces any identified harm. Similarly, it has not been treated as a benefit of the Proposed Development.

13.2.21 Guidance on the application of heritage policy within the NPPF is provided by on-line Planning Practice Guidance (DHCLG, 2016) and best practice advice is provided by a series of Historic England Advice notes (see paragraphs 13.2.14-13.2.17 below). Planning Practice Guidance

13.2.22 The Planning Practice Guidance (PPG) is a government produced on-line document that provides further advice and guidance that expands the policy outlined in the NPPF. It expands on terms such as 'significance' and its importance in decision making. The PPG clarifies that being able to properly assess the nature, extent and the importance of the significance of the heritage asset and the contribution of its setting, is very important to understanding the potential impact and acceptability of development proposals (Paragraph: 009).

¹ Footnote 63 states that those assets of archaeological interest, which are demonstrably of equivalent significance to scheduled monuments, should be considered subject to the policies for designated assets.

- 13.2.23 The PPG states that a thorough assessment of the impact on setting needs to take into account, and be proportionate to, the significance of the heritage asset under consideration and the degree to which proposed changes enhance or detract from that significance and the ability to appreciate it (Paragraph: 013).
- 13.2.24 The PPG discusses how to assess if there is substantial harm. It states that what matters in assessing if a proposal causes substantial harm is the impact on the significance of the asset. It is the degree of harm to the asset's significance rather than the scale of the development that is to be assessed (Paragraph: 017). Generally, harm to heritage assets can be avoided or minimised if proposals are based on a clear understanding of the heritage asset and its setting (Paragraph: 019).
- 13.2.25 The NPPF indicates that the degree of harm should be considered alongside any public benefits that can be delivered by development. The PPG states that these benefits should flow from the proposed development and should be of a nature and scale to be of benefit to the public and not just a private benefit and would include securing the optimum viable use of an asset in support of its long term conservation (Paragraph: 020).

Historic England Good Practice Advice Notes

- 13.2.26 Historic England have published a series of Good Practice Advice (GPA) of which those of most relevance to this appraisal are GPA2 Managing Significance in Decision-taking (March 2015) and GPA3 The Setting of Heritage Assets (2017).
- 13.2.27 GPA2 emphasises the importance of having a knowledge and understanding of the significance of heritage assets likely to be affected by the development and that the "first step for all applicants is to understand the significance of any affected heritage asset and, if relevant the contribution of its setting to its significance" (paragraph 4). Early knowledge of this information is also useful to a local planning authority in pre-application engagement with an applicant and ultimately in decision making (paragraph 7).
- 13.2.28 GPA3 provides advice on the setting of heritage assets. Setting is as defined in the NPPF and comprises the surroundings in which a heritage asset is experienced. Elements of a setting can make positive or negative contributions to the significance of an asset and affect the ways in which it is experienced. Historic England state that setting does not have a boundary and what comprises an asset's setting may change as the asset and its surrounding evolve. Setting can be extensive and particularly in urban areas or extensive landscapes can overlap with other assets. The contribution of setting to the significance of an asset is often expressed by reference to views and the GPA in paragraph 11 identifies those views such as those that were designed or those that were intended, that contribute to understanding the significance of assets.
- 13.2.29 The relationship between setting and significance is set out in a series of bullets in GPA3 that cover change, the appreciation of setting and the setting of buried assets. Setting and significance are not dependent upon public access. Designed settings such as those associated with a historic park can be extensive and project beyond the core elements of the asset. Development within the setting of an asset can be beneficial; it can also be harmful and therefore needs careful assessment.
- 13.2.30 Historic England advocates a stepped approach to assessment:
- Stage 1: identify which heritage assets and their settings are affected;
 - Stage 2: assess the degree to which these settings and views make a contribution to the significance of the heritage asset or allow significance to be appreciated;
 - Stage 3: assess the effects of the proposed development, whether beneficial or harmful, on the significance or on the ability to appreciate it;

- Stage 4: explore ways to maximise enhancement and avoid or minimise harm; and
- Stage 5: make and document the decision and monitor outcome.

Local Planning Policy

13.2.31 The North East Lincolnshire Local Plan (North East Lincolnshire Council, March 2018) has one policy relating to heritage. This is as follows:

“Policy 39: Conserving and enhancing the historic environment: Proposed developments will be permitted where they sustain the cultural distinctiveness and significance of North East Lincolnshire’s historic environment by protecting, preserving and where appropriate, enhancing the character, appearance, significance and historic value of designated and non-designated heritage assets and their settings. Proposals which protect the significance of heritage assets and conserve the historic landscape will be supported. In the case of Conservation Areas, proposed developments which preserve and enhance the special character and architectural appearance of the Conservation Area will also be supported. Proposals which would affect the significance of a heritage asset should be informed by proportionate historic environment assessments and evaluations (such as heritage impact assessments, desk-based appraisals, field evaluation and historic building reports). The impact of the significance of assets will be assessed by the council, and where an impact equates to substantial loss of significance a proposal will be considered to cause substantial harm. Permission will only be granted where substantial harm to assets of the highest significance is wholly exceptional, and for all other nationally designated assets, exceptional.”

13.3 Assessment Methodology and Significance Criteria

13.3.1 This section presents the following:

- identification of the information sources that have been consulted throughout preparation this chapter;
- the methodology behind the baseline assessment including the definition of an appropriate study area; and
- the methodology and terminology used in the assessment of effects.

Assessment Scenarios and Parameters

13.3.2 This assessment includes an investigation of the potential impact of the Proposed Development (construction, operation (including maintenance), and decommissioning) upon cultural heritage assets. Three potential construction programme scenarios have been identified as outlined in Chapter 5: Construction Programme and Management. For the purposes of this assessment there is no difference between the three scenarios, and the construction assessment presented would apply to all.

13.3.3 This initial cultural heritage assessment is based on the maximum ‘Rochdale Envelope’ dimensions for the Proposed Development (as described in Chapter 4: The Proposed Development) as this comprises the ‘worst case’ in terms of impacts on cultural heritage assets.

Impact Assessment and Significance Criteria

13.3.4 The assessment of baseline conditions was carried out in line with the guidelines of the Chartered Institute for Archaeologists (CIfA) (which provides guidelines for all aspects of the historic environment), the Standard and Guidance for Historic Environment Desk-Based Assessment (CIfA, 2017) and the Code of Conduct (CIfA, 2014). The assessments of significance and setting are made with reference to both national and local plan policy, as well as Historic England guidance.

- 13.3.5 The significance (heritage value) of a heritage asset is derived from its heritage interest which may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting. The significance of a place is defined by the sum of its heritage interest.
- 13.3.6 The significance of identified heritage assets has been determined by a site visit, professional judgment guided by statutory and non-statutory designations, national, regional and local policies, and archaeological research frameworks.
- 13.3.7 Taking these criteria into account, each identified heritage asset can be assigned a level of significance (heritage value) in accordance with the criteria as set in Table 13.1. The baseline significance (heritage value) is only provided for assets potentially affected by the Proposed Development in accordance with standard guidance for heritage assessment.

Table 13.1: Criteria for determining the significance (heritage value) of heritage assets

SIGNIFICANCE (HERITAGE VALUE)	CRITERIA
High	Assets of inscribed international importance, such as World Heritage Sites. Grade I and II* listed buildings. Grade I and II* registered historic parks and gardens. Registered battlefields. Scheduled monuments. Non-designated archaeological assets of schedulable quality and importance.
Medium	Grade II listed buildings. Grade II listed registered historic parks and gardens. Conservation Areas. Locally listed buildings included within a conservation area. Non-designated heritage assets of a regional resource value.
Low	Non-designated heritage assets of a local resource value as identified through consultation. Locally listed buildings. Non-designated heritage assets whose heritage values are compromised by poor preservation or damaged so that too little remains to justify inclusion into a higher grade.
Negligible	Assets with very little or no surviving archaeological interest. Buildings of no architectural or historical note; buildings of an intrusive character.

- 13.3.8 Having identified the significance (heritage value) of the heritage asset, the next stage in the assessment is to identify the level and degree of impact to an asset arising from the Proposed Development. Potential impacts are defined as a change resulting from the Proposed Development which affects a heritage asset. The impacts of a development upon heritage assets can be positive or negative; direct or indirect; long term or temporary and/or cumulative. Impacts may arise during construction or operation and can be temporary or permanent. Impacts can occur to the physical fabric of the asset or affect its setting.
- 13.3.9 The level and degree of impact (impact rating) is assigned with reference to the criteria as set out in Table 13.2. In respect of cultural heritage an assessment of the level and degree of impact is made in consideration of any design mitigation (embedded mitigation).

Table 13.2: Criteria for determining the magnitude of impact on heritage assets

MAGNITUDE OF IMPACT	DESCRIPTION OF IMPACT
High	Change such that the significance of the asset is totally altered or destroyed. Comprehensive change to setting affecting significance, resulting in a serious loss in our ability to understand and appreciate the asset.
Medium	Change such that the significance of the asset is affected. Noticeably different change to setting affecting significance, resulting in erosion in our ability to understand and appreciate the asset.
Low	Change such that the significance of the asset is slightly affected. Slight change to setting affecting significance resulting in a change in our ability to understand and appreciate the asset.
Very Low	Changes to the asset that hardly affect significance. Minimal change to the setting of an asset that have little effect on significance resulting in no real change in our ability to understand and appreciate the asset.

- 13.3.10 An assessment of the effect, having taken into consideration any embedded mitigation, is determined by cross-referencing between the significance (heritage value) of the asset (Table 13.1) and the magnitude of impact (Table 13.2). The resultant effect (Table 13.3) can be classified as major, moderate, minor or negligible (adverse or beneficial).

Table 13.3: Criteria for determining the significance of effect

SIGNIFICANCE (HERITAGE VALUE)	MAGNITUDE OF IMPACT			
	High	Medium	Low	Very Low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Minor	Negligible
Very Low	Minor	Negligible	Negligible	Negligible

13.3.11 Major or moderate effects are considered to be significant in Environmental Impact Assessment (EIA) terms. Within the NPPF, impacts affecting the significance of heritage assets are considered in terms of harm and there is a requirement to determine whether the level of harm amounts to 'substantial harm' or 'less than substantial harm'. There is no direct correlation between the significance of effect as reported in this PEI Report and the level of harm caused to heritage significance. A major significant effect on a heritage asset would, however, more often be the basis by which to determine that the level of harm to the significance of the asset would be substantial. A moderate significant effect is unlikely to meet the test of substantial harm and would therefore more often be the basis by which to determine that the level of harm to the significance of the asset would be less than substantial. In all cases determining the level of harm to the significance of the asset arising from development impact is one of professional judgment.

Data Sources

13.3.12 The following sources of information have been reviewed and form the basis of the assessment of likely significant effects on heritage assets:

- National Heritage List for England;
- North East Lincolnshire Council website for Planning History and Conservation Area information;
- Heritage Gateway (www.heritagegateway.org.uk);
- Archaeological Data Service (www.archaeologydataservice.ac.uk);
- National Library of Scotland (www.nls.uk); and
- Zone of Theoretical Visibility (ZTV).

13.3.13 Data has been requested from the North East Lincolnshire HER but has not yet been received. However, as the Proposed Development has previously been subject to ground disturbance (see Section 13.6 below) the lack of data will not change the baseline position.

13.3.1 The resources within the study area (defined at paragraphs 13.3.2-13.3.3 below) have been defined.

Study Areas

13.3.2 As the setting of heritage assets are not fixed, a study area of 5 km from the Site has been used to identify any highly significant designated heritage assets, which could be affected by the Proposed Development due to its scale and the significance of these assets.

13.3.3 A 1 km study area from the Site was used to identify any non-designated assets through the Heritage Gateway (in the absence of HER data at this time) to provide baseline context for the historic environment.

13.3.4 References in the remainder of this Chapter to 'study area' will refer to either the 1 km study area or the 5 km study area, depending on which is relevant for the heritage asset in question.

Consultation

13.3.5 Historic England and North East Lincolnshire Council provided comments on the scope of the cultural heritage assessment through the EIA Scoping process for the Consented Development EIA. These along with the comments received within the EIA Scoping Opinion from the Planning Inspectorate (PINS) for the Proposed Development are summarised in Table 13.4 below.

Table 13.4: Consultation summary

SUMMARY OF CONSULTEE COMMENTS	RESPONSE
Historic England (in respect of the Consented Development)	
The development is likely to have an impact on a number of designated heritage assets and their settings so the assessment should be sufficiently detailed to identify how it might be delivered sustainably without it having serious adverse effects on designated heritage assets.	The assessment in Section 13.5 considers impacts on designated assets.
The assessment should be undertaken in accordance with the NPPF.	The assessment has been undertaken in accordance with the NPPF, which is discussed in Section 13.2.
<p>The assessment should consider:</p> <ul style="list-style-type: none"> - the potential impact on the landscape especially if the site falls within an area of historic landscape; - direct impacts on historic/archaeological fabric (buildings, sites or areas) whether statutorily protected or not; - other impacts, particularly the setting of listed buildings, scheduled monuments, registered parks and gardens, conservation areas etc. including views and intervisibility between historic sites; - potential for buried archaeological remains; - effects on landscape amenity from public and private land; and - cumulative impacts. 	<p>In response to the points in turn:</p> <ul style="list-style-type: none"> - there are no designated heritage landscapes within the 5 km study area; - direct impacts on designated and non-designated heritage assets are assessed in Section 13.5; - impacts on setting are assessed in Section 13.5; - Section 13.3 summarises the potential for archaeological remains within the Site; - effects on landscape amenity are assessed in Chapter 11: Landscape and Visual Amenity; and - cumulative impacts are assessed in Chapter 17: Cumulative and Combined Effects.
<p>Our initial assessment shows the following within 5 km of the Site:</p> <ul style="list-style-type: none"> - three scheduled monuments; - four Grade I and II* listed buildings; - 20 Grade II listed buildings; and - two conservation areas. 	Section 13.3 describes all the heritage assets identified within the 5 km study area.
We strongly recommend you involve the Conservation Officers of the relevant local authorities.	The North East Lincolnshire Council Conservation Officer was consulted on the Consented Development through the EIA

SUMMARY OF CONSULTEE COMMENTS	RESPONSE
	scoping and subsequent planning application determination processes.
We recommend there should be a close link between the landscape and visual assessment and the heritage assessment.	The heritage assessment has been undertaken in co-ordination with the landscape and visual assessment.
The study area should be defined with reference to the ZTV.	As described in Section 13.3 above, the ZTV has informed the heritage assessment.
Historic England Good Practice Advice Notes 2 and 3 should be consulted.	The Good Practice Advice Notes have been consulted as described in Section 13.2.
North East Lincolnshire Council (in respect of the Consented Development)	
Without access to the HER it is difficult to comment but due to the height of the proposed stack the boundary of the search area should take in the Dock Tower and Humber Bridge (both Grade I) and views from the settlements of Great Coates, Healing, Stallingborough and Immingham which all have significant heritage assets, scheduled monuments and highly designated listed buildings.	<p>The assessment considers effects on the Dock Tower and views from heritage assets in Great Coates, Healing and Stallingborough.</p> <p>The Humber Bridge and Immingham were scoped out of the assessment due to the distances involved. Taking into consideration the wider landscape views, it is not considered that they will be affected.</p>
Planning Inspectorate (Proposed Development EIA Scoping Opinion)	
The EIA Scoping Report for the Proposed Development states that potential effects on below ground archaeology are proposed to be scoped out because the site had previously been scraped as part of the construction of the SHBPS. The advice from Historic England points out that changes in drainage patterns can also affect buried remains. This raises the possibility that buried remains beyond the boundary of the Proposed Development could be affected by changes in drainage patterns. The Inspectorate does not agree therefore that effects on below ground archaeology can be scoped out for the areas beyond the boundaries of the Proposed Development. The ES should assess impacts resulting from changes in the existing drainage regime on archaeological features outside of the Proposed Development site where significant effects are likely to occur.	Due to the nature of the Proposed Development and the previous, extensive ground disturbance across the Site there is considered to be no potential for significant effects on any archaeological deposits outside the boundary of the Proposed Development due to changes in the water table. Further details in relation to drainage are presented in PEI Report Chapter 14: Water Resource, Flood Risk and Drainage.

13.4 Baseline Conditions

13.4.1 The numbers in the brackets e.g. (A1) refer to the assets listed in the gazetteers in Table 13A.1 Appendix 13A in PEI Report Volume III and on Figure 13.1.

13.4.2 The Site is largely flat and typically stands at around 2.0 m Above Ordnance Datum (m AOD). The Main Development Area comprises grassland and the pumping station access road. In the north-east of the Main Development Area there are some scattered scrubby vegetation and discrete sections of free-standing hedgerow. Drainage ditches run along the northern, eastern and southern perimeter of the Site. There are also a number of existing buried services associated with SHBPS within the Main Development Area.

Geology

13.4.3 The bedrock of the 1 km study area is dominated by White Chalk Subgroup, with the areas immediately surrounding the River Humber, including the Site, previously being warm chalk seas during the Cretaceous period. Overlaying this are Glacial Deposits overlain by Tidal Flats Deposits of clay and silt to the east².

13.4.4 The soils within the 1 km study area consist of loamy and clayey coastal flats with naturally high groundwater³.

Designated Heritage Assets

13.4.5 There are no designated heritage assets within the Site.

13.4.6 There are three scheduled monuments located within 5 km of the Site.

13.4.7 There are seven listed buildings identified within a 5 km radius that have either a Grade I or Grade II* designation. There are also six Grade II listed buildings. All these buildings are located within existing settlements.

Heritage Baseline

13.4.8 The early prehistoric period is often less well represented in the archaeological record than later periods due to the hunter-gatherer societies that populated those periods, and thus there is no evidence of permanent settlement remains and assets are usually limited to find spots. The Neolithic (4000-2500BC) saw the adoption of farming, which led to a more sedentary lifestyle. The later prehistoric also saw the rise of funerary monuments while Bronze Age (2500 – 800BC) and Iron Age (800BC – AD43) assemblages highlight the production of metal objects. There are no assets of prehistoric date recorded within the 1 km study area.

13.4.9 The earliest recorded archaeological evidence within the 1 km study area is from the Roman period (AD43 – 410). A field walking survey was carried out on land north of the Old Fleet Drain 500 m to the south of the Site. The survey recovered Roman pottery from an area of known cropmarks (A1). Although just outside of the 1 km study area, evaluation work approximately 1.3 km to the west of the Site uncovered ditches and pottery dating to the 3rd and 4th century (Jordan, 2005) (A2). Groundworks monitoring at Acordis Works Landfill No.3 located 500 m south of the Site uncovered Roman finds but no associated features or deposits (Bracken, 1999) (A3). An initial watching brief maintained during the development of another landfill site at Courtalds in 1993 uncovered

² Source: [bgs.ac.uk/geologyofbritain](https://www.bgs.ac.uk/geologyofbritain)

³ Source: landis.org.uk/soilscapes

nothing of an archaeological nature. Most recently, an archaeological evaluation to the south of the Site (Field and McDaid, 2011) uncovered a multiphase late Roman site (**A4**), located approximately 360m south-east of the Site.

- 13.4.10 The excavation of the adjacent site undertaken in 2011 (Field and McDaid, 2011) revealed a multi-phased late Roman site with two main alignments of ditched field systems of 3rd – 4th century date recorded (**A4**).
- 13.4.11 There are no assets of early medieval date (AD410 – 1066) recorded within the 1 km study area. There is evidence that the surrounding area was in use during at least the later early medieval period. Several settlements are recorded in the Domesday Survey, 1086, including Stallingborough and Great Coates, both south-west of the Site. Greater evidence of the medieval period (AD1066 – 1500) is recorded in the 1 km study area. The closest to the Site is the suggested site of Houflet deserted medieval village (**A5**). The suggested point for this village is located 200 m to the south of the Site; however this is not necessarily accurate. The village would have extended over a greater area including within the boundaries of the Site.
- 13.4.12 Further evidence of medieval activity was uncovered in the form of medieval finds during groundworks monitoring at the Acordis Works Landfill No.3, 500 m south of the Site.
- 13.4.13 The three scheduled monuments recorded within 5 km of the Site are also of medieval date. Stallingborough medieval settlement, post-medieval house and formal gardens (NHLE 1020423) is located approximately 3.5 km to the west of the Site. The settlement site includes earthworks and associated buried remains of part of medieval Stallingborough, and additionally the earthworks of a post-medieval manor house and associated formal gardens.
- 13.4.14 The second monument is the churchyard cross 20 m south of St Peter and St Paul's Church (NHLE 1020023), Stallingborough. This is located approximately 3.3 km to the west of the Site. The scheduling includes a medieval churchyard cross and associated buried remains. The cross is also Grade II listed. The cross is cut off at 1.2 m with an inscribed sundial fixed to the top. This was added in 1725.
- 13.4.15 The third monument comprises two moated sites at Healing Hall (NHLE 1010947). These are located approximately 3.2 km to the south-west of the Site. The larger of the two is defined by a dry silted ditch whereas the smaller remains waterlogged. The smaller moat is located in the south-western corner of the larger moat.
- 13.4.16 The Church of St. Nicolas, Great Coates (NHLE 1379843) is a Grade I listed building located 3.2 km from the Site. It is of **high** significance due to its Grade I status. It is a parish church with tower built from ironstone, limestone, brick and elements of cobbles, flint and chalk which was first constructed in the 12th century. It has alterations from the 13th up until the 20th century. Its significance lies in its historic and archaeological interest, it has a long history as a parish church, being used as a focal point for community gatherings since the 12th century. It also has architectural interest due to its phases of development. The Church is located within an existing settlement to the north-west of Great Coates. The setting of the Church is the graveyard and the surrounding streets. When travelling south-east on Great Coates Road, the Church is viewed in context with SHBPS, the Site is therefore considered to form part of the setting of this Church.
- 13.4.17 An asset of post-medieval (AD1500 – 1900) date recorded within 2 km of the Site. This consists of the soil marks of possibly two post-medieval rectangular enclosures (**A6**). No further information is available regarding these features.
- 13.4.18 The Great Coates XXII.N.W. Ordnance Survey Map from 1887 shows that the Site was an area of fields located between South Marsh Road to the north of the Site and Oldfleet Drain to the south (refer to Plate 13B.1 within Appendix 13B presented in PEI Report

Volume III). No buildings or other structures are shown suggesting that the area was agricultural land running to the coast at this time.

- 13.4.19 Eleven of the listed buildings identified within a 5 km radius of the Site date to the post-medieval period.
- 13.4.20 The closest listed structure to the Site is a Grade II listed house at no.129 Station Road, Stallingborough (**NHLE 1103469**). It is located 2.4 km to the south-west of the Site. The house is a single storey structure with attic and two full raking dormers, it was built in the 18th century from brick and has a rendered finish. The building is of **medium** significance due to its architectural interest and its remaining historic fabric. Its setting is considered to be influenced by its position on the street scene; it is located within an existing urban setting with views of agricultural fields to the north-west. The Site does not form part of its setting.
- 13.4.21 The second closest listed building is Manor Farmhouse, Station Road, Great Coates (**NHLE 1379884**). This Grade II listed building is located approximately 2.8 km from the Site and comprises a two-storey farmhouse built from brick, whitewashed and rendered. Although dating from the mid-18th century it has been altered, which can be seen on the western elevation, it also has a concrete tiled roof to main house and red pantiles to the outbuildings. The house has a T-shaped floor plan, there are 19th century sash windows and 20th century casement windows. The building has **medium** significance which lies in its historic interest as an early 18th century farmhouse and through its phased development. Manor Farmhouse is located within an existing urban setting with residential dwellings to all sides. There is no intervisibility between the Site and this listed building. The setting is considered to be its immediate surroundings, its curtilage and the modern development found on the surrounding streets. The Site does not form part of its setting.
- 13.4.22 The next two listed buildings are located on Cooks Lane and have been grouped together due to their architectural form, close proximity and relationship to the Sutton Estate. Cordeaux House (**NHLE 1379419**) is a Grade II listed building built in 1820 for the Sutton Estate. No.19-22 Cooks Lane (**NHLE 1379429**) is also Grade II listed and date from a similar period. Both of these buildings have been designed to reflect the architectural style of the estate, using materials such as brick and incorporating features such as brick arches above windows and gables. Cordeaux House is a detached building built of red brick with orange brick dressings to bay window, it has white painted timber casement windows set within chamfered brick sills and a gabled wing which has a canted brick bay window with central cross windows with wooden mullion and transoms. No.19-22 Cooks Lane is also built of brick but have blue brick dressings to the two gables. The significance of these building lies within their architectural interest and historic interest as estate houses. They are of **medium** significance due to their Grade II listed status. Their significance lies in their architectural and historic interest as estate buildings and relationship with the development of the settlement. The listed buildings are located on Cooks Lane and surrounded by existing residential development, their setting is therefore considered to be the immediate urban context. There is no intervisibility or historical relationship between the listed buildings and the Site which is approximately 2.8 km north and the Site does not form part of their setting.
- 13.4.23 The listed buildings of the Manor House, including Stables and Coach House (**NHLE 1379430**) and Dovecote and Stables to the north-west of the Manor House (**NHLE 1379431**) are both located at the end of Cooks Lane and form a single group of buildings. These Grade II listed buildings are located 2.8 km to the south of the Site. The Manor House dates to the mid-18th century and is built of brick which has been stucco rendered on the southern and eastern elevations, it has sliding sash windows and a hipped slate

roof. The house was altered and remodelled in 1878 and the 20th century. The stable and coach house range are located to the rear and now form part of the house. Its significance lies in its architectural and historic interest being an example of an 18th century farmhouse. The Dovecote and Stable are located to the north-west of the Manor House. The two-storey brick dovecote and single storey stable range date from the late 18th century. The stables are rectangular and sit along the northern edge of the property; the dovecote is square plan and located to the west end. Dovecote has a pyramidal roof and a single row of dove holes between sandstone ledges. Stable range has a gig house to right with double boarded doors. They are of **medium** significance and their significance is considered to relate to their historic interest due to their association with the Manor House as ancillary structures, they also have architectural interest in their form and construction. Manor House, the stable and dovecote are located on the northern fringe of Great Coates, the buildings back onto agricultural fields to the north. There are views of fields, railway line and a major road junction to the north-east. Beyond this there are large scale industrial buildings to the north-east which includes the Site and South Humber Bank Power Station. The setting of these assets is considered to be its former farmland and its relationship with the surrounding farm buildings, and although the industrial development in the north-east can be viewed at a distance, the listed buildings are not experienced in the same context as the industrial development. Therefore, the Site does not form part of the setting of these listed buildings.

- 13.4.24 The Church of St. Peter and St. Paul, Stallingborough (**NHLE 1346978**) is designated Grade II* and is located 3.4 km from the Site. It represents a parish church with tower which was constructed between 1779 and 1791. Alterations have been carried out including windows, internal layout and alterations to the chancel in the early 20th century. Its significance lies in its architectural interest as an 18th century church and its historic interest due its position within the local community. It is of **high** significance due to its Grade II* status and its significance lies in its historic and architectural interest as an altered 18th century parish church. Its setting is defined as being its immediate curtilage including the church yard as well as the agricultural fields which surround the church. There are views of industrial development to the east which includes the existing South Humber Bank Power Station and the Site. There is limited visibility of the Site from the Church due to intervening infrastructure and tree coverage. However, due to the Church tower, the church is experienced within the surrounding countryside and would be viewed in context with the Proposed Development. The Site is considered to form part of the setting of this Church.
- 13.4.25 The Church of St. Michael, Little Coates (**NHLE 1379845**) is a Grade I listed building located approximately 4.1 km from the Site. It is of **high** significance due to its Grade I listed building status. Its significance lies in its historic and architectural interest. It is a stone built church with a tower, nave, aisle and chancel that has origins from the 14th century and has been altered in the 17th and 20th centuries. The church is located on the edge of the settlement of Little Coates and to the south of the settlement of Great Coates. The Site does not form part of the setting of this designated heritage asset.
- 13.4.26 Grimsby Haven Lock and Dock Wall (58 m long adjoining to west), The Docks, Grimsby (**NHLE 1379856**) is a Grade II* listed building located 4.7 km to the south-east of the Site. This asset is a lock basin and quayside wall. The asset is of **high** significance due to its Grade II* listed status, and its significance lies in its historic interest as the first dock in Grimsby. Works to construct the dock began in 1797 and comprises of vaulted (or hollow) walls which are wider at the base. Its setting is comprised of the immediate industrial surroundings and the relationship with the Humber Estuary to the north. The Site is located to the north-west and does not form part of the setting of this asset.

- 13.4.27 The Hydraulic Accumulator Tower (**NHLE 1379871**) to the west of the Dock Tower is a Grade II* listed building located 4.7 km to the south-east of the Site. It is a red/ brown brick structure with ashlar dressings and is 23.7 m tall. This tower was constructed to provide high pressure hydraulic power to move the gates to the east and west locks in the Royal Dock and also powered machinery located on the dockside. It was primarily built to replace the Dock Tower in 1892. The asset is of **high** significance and its significance lies in its historic interest as an early example of a hydraulic system. Its setting is considered to be the immediate surrounds of the dock and the way that it is viewed in context with The Dock Tower, the docks and the Humber Estuary. The setting also encapsulates the industrial environs to the north-west, and therefore the Site forms part of the setting of the Hydraulic Accumulator Tower.
- 13.4.28 The Dock Tower, Royal Dock, Grimsby (**NHLE 1379870**) is a Grade I listed structure located at the Royal Dock in Grimsby. It is a tall structure which stands at 94 m in height and was constructed in 1852 for The Grimsby Dock Company. It is built of red brick with limestone to the base plinth and ashlar stone to the top with an iron lantern. The asset is of **high** significance due to its historic use as a tower to provide water pressure to power hydraulic machinery at the docks. Its setting is considered to be the Humber Estuary and surrounding docks with which it has a strong relationship. The wider surrounds contain industrial buildings to the north-west and commercial and residential to the south. The Site is 4.8 km to the north-west and forms part of the industrial setting of this asset.
- 13.4.29 The Lincolnshire XIV Ordnance Survey maps of 1905, 1932 and 1951 (refer to Plate 13B.2 within Appendix 13B presented in PEI Report Volume III) shows that the Site was still agricultural throughout the early 20th century with only minor additions including the Grimsby District Light railway which runs northwest to south-east to the west of the Site. This railway is still extant.
- 13.4.30 The existing South Humber Bank Power Station (0366/1/0) (**A7**) was developed between 1994 and 1999 causing major change within the area. The power station is located to the immediate west of the Main Development Area. The current aerial photograph shows the Main Development Area (refer to Plate 13B.3 within Appendix 13B presented in PEI Report Volume III) as open ground though is bisected by an access road while ponds are evident to the north-east and south. It is bounded to the north and south by drains and to the west by the existing Power Station.
- 13.4.31 There is no apparent evidence for cropmarks which could indicate the presence of sub-surface archaeological features.
- 13.4.32 There is one listed building dating to the modern period within the 1 km study area, the former heavy anti-aircraft gun site (**NHLE 1403222**). The site of the anti-aircraft gun is a Grade II* listed building located near to Stallingborough and is 4.5 km from the Site. It is a former Heavy Anti-Aircraft (HAA) gun site located off Keelby Road that includes a World War 2 HAA gun site for 5.25 inch guns. The gun site comprises a command post with four gun emplacements forming an arc around it. Each gun emplacement includes an engine house and the base of the former crew rest shelter. There is the former guardhouse building and former generator house. The site is of **high** significance and its significance relates to its historic interest as it is one of only six surviving gun sites and retains its functional layout and some of the buildings. It has technological and historic interest due to its former use and is considered to be an example of where female soldiers had been stationed. Its setting is formed of the grounds in which it is situated and the surrounding agricultural fields. The Site does not form part of its setting due to distance, intervening infrastructure and tree coverage and it is not experienced in the same context.

Conservation Area

- 13.4.33 The Great Coates Conservation Area is located to 2.65 km to the south of the Site and is within the North East Lincolnshire Council area. It was designated in 1972 and extended in 1993. It covers the north-west corner of the settlement and the historic core of Great Coates. The parish church is located to the south-west with the remainder of the buildings being predominantly residential and built off the main spine road through Great Coates. The asset is of **medium** significance as it is a conservation area.

Future Baseline

- 13.4.34 The future baseline is not expected to change from the existing baseline described above. If the Consented Development is progressed, the impacts described below for the Proposed Development (which is the same scale and nature as the Consented Development) would be present in the future baseline scenario.

13.5 Development Design and Impact Avoidance

- 13.5.1 The development design will not physically impact any heritage assets, and there are no recorded assets within the Site boundary. Therefore, there has been no amendment to the design for heritage assets.

13.6 Likely Impacts and Effects

- 13.6.1 This section identifies the potential impacts resulting from the Proposed Development. The magnitude of impacts is defined and the significance of effects is determined in accordance with the identified methodology presented in Section 13.3 above.

The Proposed Development

- 13.6.2 The impacts and effects of the Proposed Development compared to a future baseline without the Consented Development are described below.

Construction

- 13.6.3 The construction works for the Proposed Development will include earthworks and excavations, construction of the new buildings and stacks, movement of construction traffic and machinery, potential noise and dust, and temporary lighting during construction.
- 13.6.4 Construction impacts on heritage assets are solely impacts on setting which result from the construction activities and the physical development.

Scheduled Monuments

- 13.6.5 There are no effects on the significance of the scheduled monuments within the wider, 5 km study area, due to the distance of assets from the development and intervening screening by buildings and vegetation.

Listed Buildings

- 13.6.6 The listed buildings located within the 5 km study area are experienced in a relatively flat topography and some are viewed in context with the existing South Humber Bank Power Station and neighbouring industrial buildings. The following assessment has been carried out through a site visit and analysing the ZTV (see Chapter 11: Landscape and Visual Amenity).
- 13.6.7 129 Station Road (**NHLE 1103469**) is a Grade II listed building of medium significance. The significance of the building lies in its architectural and historic interest associated with its early construction date and vernacular appearance. Its setting within an existing urban settlement contributes to its significance. The construction of the Proposed Development

would result in no impact upon the significance as it will not change the setting of the asset.

- 13.6.8 Manor Farmhouse (**NHLE 1379884**) is a Grade II listed building of medium significance. Its significance comprises of historic interest as an early 18th century farmhouse. Its setting within an existing urban environment means that the construction of the Proposed Development will have no impact upon its setting.
- 13.6.9 Cordeaux House (**NHLE 1379419**) and no.19-22 Cooks Lane (**NHLE 1379429**) are Grade II listed buildings of medium significance. Their significance relates to their architectural and historic interest as estate houses built for the Sutton Estate. The construction of the Proposed Development will have no impact upon their significance or setting as the setting of these listed buildings is formed of their immediate urban context.
- 13.6.10 Manor House, including Stables and Coach House (**NHLE 1379430**) and Dovecote and Stables to the north-west of the Manor House (**NHLE 1379431**) are all Grade II listed buildings of medium significance. Their setting has been assessed as being the surrounding farmland and the former farmyard. The Site does not form part of their setting and therefore there will be no impact upon their significance due to the construction of the Proposed Development.
- 13.6.11 The former heavy anti-aircraft gun site (**NHLE 1403222**) is a Grade II* listed building located over 3 km from the Site. It is of high significance and its significance lies in its historic interest as a former use and history. There will be no impact on the significance of the asset due to the Site not forming part of its setting.
- 13.6.12 Church of St. Michael, Little Coates (**NHLE 1379845**) is a Grade I listed building of high significance. The significance of the building lies in its architectural and historic interest associated with its early construction date and vernacular appearance. Its setting within an existing urban settlement contributes to its significance. The construction of the Proposed Development would not change the setting of the asset and have no impact upon its significance.
- 13.6.13 Grimsby Haven Lock and Dock Wall, Grimsby (**NHLE 1379856**) is a Grade II* listed buildings of high significance. The significance of the building lies in its historic interest as the first dock in Grimsby. Its setting within the immediate industrial development of Grimsby Docks will not be changed by the construction of the Proposed Development.
- 13.6.14 The Hydraulic Accumulator Tower (**NHLE 1379871**), is a Grade II* listed building of high significance. The significance of the building lies in its historic interest as an early example of a hydraulic system. The setting of the tower within the immediate industrial development of Grimsby Docks and its relationship with the Humber Estuary will be unchanged as a result of the construction of the Proposed Development, therefore there will be no impact.
- 13.6.15 The Dock Tower, Royal Dock, Grimsby (**NHLE 1379870**) is a Grade I listed building of high significance. The significance of the building lies in its historic interest as an early example of a system to provide water pressure to the power hydraulic machinery on the docks. The setting of the tower within the immediate industrial development of Grimsby Docks and its relationship with the Humber Estuary will be unchanged as a result of the construction of the Proposed Development, therefore there will be no impact.
- 13.6.16 The Church of St. Nicolas, Great Coates (**NHLE 1379843**) is of high heritage significance due to its Grade I listed status. It is located to the south-west of the Site. Although located 3.5 km away, the existing South Humber Bank Power Station is viewed in the same context as the Church when approaching Great Coates from the north-west. At this asset the Proposed Development will also be viewed in the same context when constructed to the east of SHBPS. Due to the existing industrial setting to the north-east, and following

a site visit and analysing the ZTV the construction of the Proposed Development is assessed to result in very low magnitude of impact to the setting of the Church of St. Nicolas as it will have a negligible effect on the significance of the designated heritage asset. There will be little effect upon its setting and no change in the ability to understand its significance. On an asset of high significance (heritage value), the significance of the effect is assessed as being a minor adverse which is not significant.

- 13.6.17 The Grade II* Church of St. Peter and St. Paul in Stallingborough (**NHLE 1346978**) is located 3.5 km to the south-west of the Site. The level of impact will be very low magnitude of impact as the setting of the Church will hardly be affected by the Proposed Development. The Proposed Development will be visible from the tower of the church; however, this will be a continuation of the existing industrial landscape located to the east of the Church. On the asset of high significance (heritage value), the significance of the effect will be minor adverse which is not significant.

Conservation Area

- 13.6.18 The Great Coates Conservation Area is of medium significance. There will be no impact upon the significance of the asset as the setting of the asset will not change and the understanding of the asset will be unaffected by the proposed extension to the industrial development to the north of Great Coates.

Operation

- 13.6.19 The operation of the Proposed Development will result in an increased amount of traffic, and potential for increased noise and light levels within the Main Development Area. Due to its industrial context, this will not result in a perceptible increase over the existing situation; therefore, there will be no impact on the significance of the assets identified.

Decommissioning

- 13.6.20 Decommissioning impacts will be temporary and will be similar to construction impacts (movement of traffic and machinery, potential for noise and dust and use of temporary lighting). The impacts will not be greater than those reported during construction (not significant).
- 13.6.21 Removal of above ground structures may reduce impacts on the setting of designated assets. The removal of the structures on the Main Development Area will reduce the impact upon the setting of the Church of St. Nicolas, Great Coates (NHLE 1379843) and the Church of St. Michael, Little Coates (NHLE 1379845).

Comparison of Proposed Development and Consented Development

- 13.6.22 The impacts and effects of the Proposed Development compared to a future baseline with the Consented Development are described below.

Construction

- 13.6.23 The additional works required for the Proposed Development are insignificant relative to the works that comprise the Consented Development. The predicted impacts as a result of the Proposed Development are therefore the same as those that would be associated with the Consented Development because the nature and overall scale of construction activity required for the Proposed Development (with the potential to impact on heritage assets, including impacts on setting) would be the same as the Consented Development.
- 13.6.24 As such, the construction of the Proposed Development is predicted to have no additional effect compared to a future baseline with the construction of the Consented Development.

Opening and Operation

13.6.1 The additional aspects of the Proposed Development are insignificant relative to the Consented Development, and the traffic, noise and light impacts associated with the Proposed Development will be the same as those associated with the Consented Development.

13.6.2 As such, the operation of the Proposed Development is predicted to have no additional effect compared to a future baseline with the operation of the Consented Development.

Decommissioning

13.6.3 The nature and scale of decommissioning activities required for the Proposed Development would be the same for the Proposed Development as for the Consented Development, so the decommissioning of the Proposed Development is predicted to have no additional impact compared to a future baseline with the decommissioning of the Consented Development.

13.7 Mitigation and Enhancement Measures

13.7.1 No mitigation is required for designated heritage assets or non-designated heritage assets.

13.7.2 Due to the nature of the likely effects on built heritage there are no mitigation measures available; however, mitigation is not considered necessary as the predicted effects are not significant.

13.8 Limitations or Difficulties

13.8.1 No other limitations or difficulties have been identified during this assessment.

13.9 Residual Effects and Conclusions

13.9.1 The historic environment is characterised by small built up settlements. The significance of the assets within these settlements will not be adversely affected by the Proposed Development.

13.9.2 Impacts to the historic environment resulting from the Proposed Development are limited to assets located on the edge of the nearby settlement and high level designated heritage assets which have taller elements, such as churches. There will be no effects on any of the assets identified as a result of the Proposed Development during construction, operation or decommissioning. This includes: 129 Station Road, Stallingborough (**NHLE 1103469**), Manor House, including Stables and Coach House (**NHLE 1379430**) and Dovecote and Stables to the north-west of the Manor House (**NHLE 1379431**); Manor Farmhouse, Station Road, Great Coates, Grimsby (**NHLE 1379884**); Cordeaux House, 15 Cooks Lane, Great Coates, Grimsby (**NHLE 1379419**); No.19-22 Cooks Lane, Great Coates, Grimsby (**NHLE 1379429**); The Manor House including stables and coach house, Cooks Lane, Great Coates (**NHLE 1379430**); Dovecote and Stable to north-west of Manor House, Great Coates, Grimsby (**NHLE 1379431**), Former heavy anti-aircraft gun site, near Stallingborough (**NHLE 1403222**); Church of St. Nicolas, Great Coates, Grimsby (**NHLE 1379843**); Grimsby Haven Lock and Wall, Grimsby (**NHLE 1379856**); Hydraulic Accumulator Tower (**NHLE 1379871**); and The Dock Tower (**NHLE 1379870**).

13.9.3 There will be a minor adverse (not significant) effect upon the Church of St. Peter and St. Paul (**NHLE 1379845**) during construction of the Proposed Development due to the Church's location on the edge of Stallingborough which is to the west of the Site. Its location results in the Site forming part of the setting of the designated heritage asset and the Proposed Development will change the setting by the addition of a new structure. The Proposed Development will have a negligible effect on the significance of the asset and will not result in a change in the understanding of the asset.

- 13.9.4 There will be a minor adverse (not significant) effect upon the Church of St. Nicolas, Great Coates; (**NHLE 1379845**) during construction of the Proposed Development due to the Church's location on the edge of Little Coates. Its location results in the Site forming part of its setting and the Proposed Development will alter the setting through the construction of a new structure. Although the Site forms part of the setting, the Proposed Development will not affect the significance of the asset.

Table 13.5: Summary of residual cultural heritage effects

REFERENCE NUMBER	ADDRESS	ASSET TYPE	GRADE	HERITAGE SIGNIFICANCE	MAGNITUDE OF IMPACT (INCORPORATING ANY EMBEDDED MITIGATION)	EFFECT	PROPOSED MITIGATION	RESIDUAL EFFECT
1346978	Church of St. Peter and St. Paul, Stallingborough	Listed Building	II*	High	Very low	Minor adverse (not significant)	None	Minor adverse (not significant)
1379843	Church of St. Nicolas, Great Coates, Grimsby	Listed Building	I	High	Very low	Minor adverse (not significant)	None	Minor adverse (not significant)

13.10 References

Chartered Institute for Archaeologists (2017) Standard and Guidance for Historic Environment Desk-based Assessment.

Chartered Institute for Archaeologists (2014) Code of Conduct.

Department for Communities and Local Government (DCLG) (2019) National Planning Policy Framework. DCLG, London.

Department for Communities and Local Government (2014) National Planning Policy Framework (NPPF) Planning Practice Guidance. DCLG, London.

Department for Energy and Climate Change (2011) Overarching National Policy Statement for Energy (EN-1)

Field, N and McDaid, M (2011) Biomass Generating Station, Hobson Way Stallingborough, North-East Lincolnshire Archaeological Excavation. Naomi Field Archaeological Consultancy. SBP 07.

Historic England (2008) Conservation Principles, Policies and Guidance.

Historic England (2015) Historic Environment Good Practice Advice in Planning Note 1. The Historic Environment in Local Plans.

Historic England (2015a) Historic Environment Good Practice Advice in Planning Note 2. Managing Significance in Decision Taking.

Historic England (2017) Historic Environment Good Practice Advice in Planning Note 3. The Setting of Heritage Assets.

North East Lincolnshire Council (2018) North East Lincolnshire Local Plan – Adopted March 2018.

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14.0 WATER RESOURCES, FLOOD RISK & DRAINAGE

14.1 Introduction

- 14.1.1 This chapter of the Preliminary Environmental Information (PEI) Report addresses the potential effects of the construction, operation (including maintenance) and decommissioning of the Proposed Development on surface water, flood risk and drainage. It identifies key water resources and sensitivities and highlights potential direct and indirect impacts on them from the Proposed Development.
- 14.1.2 This chapter is supported by Figure 14.1 presented in PEI Report Volume II, a Flood Risk Assessment (FRA) presented in Appendix 14A in PEI Report Volume III and an Outline Drainage Strategy presented in Appendix 14B in PEI Report Volume III.
- 14.1.3 The FRA in Appendix 14A in PEI Report Volume III details the existing levels of flood risk associated with the Site and the surrounding area, quantifies the volume of surface water on the Site requiring management, identifies the impacts that the Proposed Development would have upon these aspects, and suggests potential mitigation or control measures to reduce the impact and manage the risk of flooding.
- 14.1.4 The Outline Drainage Strategy for the Proposed Development in Appendix 14B in PEI Report Volume III provides guidance and information with regards to the effective and safe drainage of surface water for the Site. The final drainage design will be completed during the detailed design stage.
- 14.1.5 Other than the risk of groundwater flooding, potential impacts and effects associated with groundwater underlying the Site are addressed within Chapter 12: Geology, Hydrogeology and Land Contamination, due to overlap between the two subject areas.
- 14.1.6 The scope of assessment for this chapter comprises assessment of the following potential impacts:
- potential change to the surrounding ditches (culverting/ extension to culverts/ installation of fencing);
 - potential temporary changes to surface water flows within Flood Zone 3 during construction;
 - change to the impermeable area within the Site and associated changes to surface water flows during operation;
 - potential loss of floodplain storage as the footprint of the Proposed Development is located in Flood Zone 3 (although the Site benefits from existing maintained defences);
 - pollution of surface watercourses within or near the Site during construction due to spillages or polluted surface water runoff entering the watercourse (if appropriate pollution prevention measures are not implemented); and
 - pollution of surface watercourses within or near the Site during operation, due to spillages or polluted surface water runoff entering the watercourse (if appropriate pollution prevention measures are not implemented).

14.2 Legislative and Planning Policy Context

European Legislation

- 14.2.1 The European Union (EU) Water Framework Directive (WFD) (2000/60/EC) is the primary European legislation setting the context for this assessment. The purpose of the Directive is to establish a framework for the protection and improvement of inland

surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater.

- 14.2.2 The Directive requires the UK to classify the current condition of key waterbodies (giving a 'status' or 'potential') and to set objectives to either maintain the condition, or improve it where a waterbody is failing minimum targets. Any activities or developments that could cause deterioration within a nearby waterbody, or prevent the future ability of a waterbody to reach its target status, must be mitigated so as to reduce the potential for harm and allow the aims of the WFD to be realised.

National Legislation

- 14.2.3 The Water Resources Act 1991 (as amended) sets out the relevant regulatory controls that provide protection to waterbodies and water resources (from abstraction pressures and pollution).

- 14.2.4 Other relevant national legislation which set out requirements related to control and protection of water resources and flood risk management includes:

- the Flood and Water Management Act 2010 (FWMA);
- the Water Act 2003 and Water Act 2014 which govern the control of water abstraction, discharge to water bodies, water impoundment, conservation and drought provision;
- the Environment Act 1995 which established the Environment Agency and its statutory role in water resource protection;
- the Environmental Protection Act 1990 which provides for integrated pollution control; and
- the Land Drainage Act 1991 which provides for drainage management related to non-main rivers.

- 14.2.5 A number of specific regulations have been enacted to enact European and national legislation. These regulations include:

- ;
- the Water Environment (WFD) Regulations 2015;
- the Anti-Pollution Works Regulations 1999;
- the Control of Pollution (Oil Storage) (England) Regulations 2001;
- the Environmental Damage Regulations 2009;
- the Flood Risk Regulations 2009;
- the Water Resources Act (Amendment) (England and Wales) Regulations 2009;
- the Environmental Permitting (England and Wales) Regulations 2016 which control discharge of water to surface water and groundwater; and
- the Water Supply (Water Quality) Regulations 2010.

- 14.2.6 The FWMA, enacted by Government in 2010 in response to The Pitt Review (Pitt, 2008) designated unitary authorities, such as North East Lincolnshire Council (NELC), as Lead Local Flood Authorities (LLFAs). As a LLFA, NELC has responsibilities to lead and co-ordinate local flood risk management. Local flood risk is defined as the risk of flooding from surface water run-off, groundwater and ditches and watercourses (collectively known as ordinary watercourses).

- 14.2.7 The FWMA also formalises the flood risk management roles and responsibilities for other organisations including the Environment Agency, water companies and highways

authorities establishing them as Risk Management Authorities (RMAs). The responsibility to lead and co-ordinate the management of tidal and fluvial flood risk remains that of the Environment Agency.

Planning Policy Context

National Policy Statements

14.2.8 The Overarching National Policy Statement (NPS) for Energy (EN-1) Section 5.7 (Flood Risk) (Department for Energy and Climate Change, 2011a) details that projects of 1 hectare (ha) or greater in Flood Zone 1 in England and all proposals for energy projects located in Flood Zones 2 and 3 in England should be accompanied by a FRA.

14.2.9 The requirements for FRAs are that they should:

- be proportionate to the risk and appropriate to the scale, nature and location of the project;
- consider the risk of flooding arising from the project in addition to the risk of flooding to the project;
- take the impacts of climate change into account, clearly stating the development lifetime over which the assessment has been made;
- be undertaken by competent people, as early as possible in the process of preparing the proposal;
- consider both the potential adverse and beneficial effects of flood risk management infrastructure, including raised defences, flow channels, flood storage areas and other artificial features, together with the consequences of their failure;
- consider the vulnerability of those using the Site, including arrangements for safe access;
- consider and quantify the different types of flooding (whether from natural and human sources and including joint and cumulative effects) and identify flood risk reduction measures, so that assessments are fit for the purpose of the decisions being made;
- consider the effects of a range of flooding events including extreme events on people, property, the natural and historic environment and river and coastal processes;
- include the assessment of the remaining (known as 'residual') risk after risk reduction measures have been taken into account and demonstrate that this is acceptable for the particular project;
- consider how the ability of water to soak into the ground may change with development, along with how the proposed layout of the project may affect drainage systems;
- consider if there is a need to be safe and remain operational during a worst case flood event over the development's lifetime; and
- be supported by appropriate data and information, including historical information on previous events.

14.2.10 In determining an application for development consent, the Planning Inspectorate should be satisfied that where relevant:

- the application is supported by an appropriate FRA;
- the Sequential Test has been applied as part of site selection;

- a sequential approach has been applied at the site level to minimise risk by directing the most vulnerable uses to areas of lowest flood risk;
- the proposal is in line with any relevant national and local flood risk management strategy;
- priority has been given to the use of sustainable drainage systems (SuDs); and
- in flood risk areas the project is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed over the lifetime of the development.

14.2.11 Section 5.15 of NPS EN-1 details that where the project is likely to have effects on the water environment, the applicant for development consent should undertake an assessment of the existing status of, and impacts of the proposed project on, water quality, water resources and physical characteristics of the water environment as part of the ES or equivalent.

14.2.12 Overarching National Policy Statement for Renewable Energy Infrastructure (EN-3) (Department of Energy and Climate Change, 2011b) provides the following general guidance relating to flood risk assessments and climate change pertaining to renewable energy production facilities:

- consider how the proposal would be resilient to effects of rising sea levels and increased risk from storm surge and tidal flooding resulting from climate change; and
- consider how plant will be resilient to increased risk of flooding and increased risk of drought affecting river flows.

National Planning Policy Framework

14.2.13 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2019a) sets out 17 planning principles as guidance for local councils for the creation of their local plan; the following principles are directly applicable to the water environment:

“10. Meeting the challenge of climate change, flooding and coastal change – support the transition to a low carbon future in a changing climate taking full account of (inter alia) flood risk and coastal change; and

“11. Conserving and enhancing the natural environment – development should minimise pollution and other adverse effects on the local and natural environment and should plan positively for the creation, protection, enhancement and management of networks of biodiversity and green infrastructure”.

14.2.14 The NPPF require that any proposed developments are built to withstand tidal flooding up to a 1% AEP (1 in 100 chance) event taking into account the potential impacts of climate change.

Planning Practice Guidance

14.2.15 The Planning Practice Guidance (PPG) (Ministry of Housing, Communities and Local Government, 2019b) contains guidance in relation to water supply, wastewater and water quality, and flood risk management. It also provides advice and information on how planning can and should protect water quality; ensure the delivery of adequate water and wastewater infrastructure for new development, and ensure development is protected from flood risk and does not increase flood risk elsewhere.

Non-Statutory Technical Standards for Sustainable Drainage Systems (2015)

14.2.16 The Non-Statutory Technical Standards for Sustainable Drainage Systems (Defra, 2015) was published in March 2015 and is the current guidance for the design, operation and maintenance of SuDS. The standards set out the following:

- peak run-off rates should be as close as is reasonably practicable to the pre-development equivalent values ('greenfield' rate), but should never exceeds the pre-development run-off rate;
- the drainage system should be designed so that flooding does not occur on any part of a development site for a 1 in 30 year rainfall event, and that no flooding of a building (including basement) would occur during a 1 in 100 year rainfall event; and
- pumping should only be used when it is not reasonably practicable to discharge by gravity.

14.2.17 The Proposed Development will also be considered by the Environment Agency in terms of the Land Drainage Act 1991 and the Water Resources Act 1991. Consent from the Environment Agency will be required for any proposed discharges to controlled waters.

Regional Policy*East Inshore and East Offshore Marine Plans*

14.2.18 The East Inshore and East Offshore Marine Plans (Defra, 2014) are guidance documents for developers to ensure the sustainable development of the marine area and protection of the marine ecosystem.

14.2.19 The East Inshore Marine Plan area includes the coastline stretching from Flamborough Head to Felixstowe, extending out to the seaward limit of the territorial sea (approximately 12 nautical miles). It also includes:

- any area submerged at mean high water spring tide;
- the waters of any estuary, river or channel, so far as the tide flows at mean high water spring tide; and
- waters in any area which is closed (permanently or intermittently) by a lock or other artificial means against the regular action of the tide, but into and from which seawater is caused or permitted to flow (continuously or from time to time).

14.2.20 This includes the tidal limits for the Humber Estuary, which incorporates areas of North East Lincolnshire. The East Inshore Marine Plan states "*A clean and healthy marine environment, including healthy beaches and good water quality, are important to tourism and recreation*". Relevant district wide policies include:

- Policy TR1: Proposals for development should demonstrate that during construction and operation, in order of preference:
 - a) they will not adversely impact tourism and recreation activities;
 - b) how, if there are adverse impacts on tourism and recreation activities, they will minimise them;
 - c) how, if the adverse impacts cannot be minimised, they will be mitigated; and
 - d) the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts.
- Policy TR2: Proposals that require static objects in the East Inshore Marine Plan areas, should demonstrate, in order of preference:

- a) that they will not adversely impact on recreational boating routes;
- b) how, if there are adverse impacts on recreational boating routes, they will minimise them;
- c) how, if the adverse impacts cannot be minimised, they will be mitigated; and
- d) the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts.

14.2.21 In addition, the following policy in relation to climate change is also applicable:

- Policy CC1: Proposals should take account of:
 - a) how they may be impacted upon by, and respond to, climate change over their lifetime;
 - b) how they may impact upon any climate change adaptation measures elsewhere during their lifetime; and
 - c) where detrimental impacts on climate change adaptation measures are identified, evidence should be provided as to how the proposal will reduce such impacts.

14.2.22 No works are required within the river or to flood defences within the East Inshore Marine Plan area in proximity to the Site therefore no Deemed Marine Licence is required.

Grimsby and Ancholme Catchment Flood Management Plan (Environment Agency 2009)

14.2.23 The role of Catchment Flood Management Plans (CFMP) are to identify flood risk management policies which will assist all key decision makers in the catchment to deliver sustainable flood risk management for the long term. The Grimsby and Ancholme CFMP considers all types of inland flooding, from rivers, ground water, surface water and tidal flooding, but not flooding directly from the sea (coastal flooding).

14.2.24 The Site is located within the Grimsby and Ancholme CFMP study area. This region specific CFMP explores flood risk from surface water, groundwater, main rivers and ordinary watercourses but will not account for tidal flooding.

14.2.25 The Grimsby and Ancholme CFMP identifies the Oldfleet Drain (a main river) to be a main source of fluvial flood risk to the Humber Trade Zone Industrial Area, which includes the Site and surrounding area. No other site-specific information is found in the report.

Flamborough Head to Gibraltar Point Shoreline Management Plan (SWHECA, 2010)

14.2.26 The Site is potentially vulnerable to tidal flooding from the Humber Estuary and the Site location falls into 'Sub Area 4: Immingham, Grimsby and Buck Beck' of the local Flamborough Head to Gibraltar Point Shoreline Management Plan (SMP).

14.2.27 The purpose of an SMP is to identify the most sustainable approach to managing the flood and coastal erosion risks to the coastline in the short-term (0 to 20 years), medium term (20 to 50 years) and long term (50 to 100 years).

14.2.28 The report identifies the Site to be in an area of low to high flood risk depending on the flood source, where the LLFA and the Environment Agency are already working towards managing the risk. However, it is also an area that will be affected by climate change due to the low lying land and its coastal location, and so will need ongoing maintenance and defence improvements.

Humber Flood Risk Management Strategy (Environment Agency, 2008)

14.2.29 The Site lies within 'Area 24 - Immingham to West Grimsby' of the Humber Flood Risk Management Strategy (FRMS). Policies to manage the risk of flooding in this area are:

- defences here will be improved as necessary to protect the large number of people, businesses and nationally important industry from tidal flooding;
- develop plans to improve the defences near North Killingholme and Stallingborough within the next five years; and
- the Environment Agency will work closely with other authorities and developers to ensure the risk is managed effectively together.

Anglian Water Surface Drainage Policies

14.2.30 The Outline Drainage Strategy presented within Appendix 14B in PEI Report Volume III, states Anglian Water policies regarding surface water drainage should be considered. The following should occur on Site where appropriate:

- discharge by infiltration to the ground;
- discharge to an open surface water body;
- discharge to a surface water sewer;
- discharge to a combined sewer; and/ or
- discharge to a foul sewer.

14.2.31 Discharge rates and volumes are to be limited to the equivalent greenfield runoff rate (with on Site attenuation for all events up to the 1 in 100 rainfall event plus climate change). Flooding must also not occur on any part of the development for the 1 in 30 year rainfall event.

Local Planning Policy*North East Lincolnshire Local Plan 2013 to 2032 (NELC, 2018)*

14.2.32 The following policies of the adopted North East Lincolnshire Local Plan 2013 to 2032 (NELC, 2018) are considered relevant to the Proposed Development:

- SO2 – Climate Change;
- Policy 33 – Flood Risk;
- Policy 34 – Water Management;
- Policy 43 – Green Space and Recreation; and
- Policy 48 – Safeguarding waste facilities and related infrastructure.

North and North East Lincolnshire Strategic Flood Risk Assessment (SFRA) (North East Lincolnshire Council, 2011) and Addendum (NELC, 2016)

14.2.33 The North and North East Lincolnshire SFRA was written in 2011 and provides the Local Planning Authorities (LPAs) with information to make objective judgements about flooding, both when making decisions on land allocations for development plans and when determining planning applications for development in their areas.

14.2.34 The SFRA provides a series of maps detailing the hydrological features in the vicinity of the Site, identifying the responsibilities for these by the North East Lindsay (NEL) Internal Drainage Board (IDB) (for Significant Ordinary Watercourses) and the Environment Agency (for Main Rivers), and presents records of historical flooding incidents in the vicinity. The SFRA identifies the South Humber Bank as a strategic employment area as defined in the NELC Local Plan, and also provides site-specific

guidance for developers to consider in regard to mitigation of any identified flood risks from all sources.

- 14.2.35 An Addendum to the SFRA was completed in April 2016 containing updated maps for a tidal defence breach hazard scenario provided by the Environment Agency. No specific policies are presented in relation to the Site.

North and North East Lincolnshire Preliminary Flood Risk Assessment (Entec, 2011)

- 14.2.36 The North and North East Lincolnshire Preliminary Flood Risk Assessment (PFRA) was a high level screening exercise that compiled information on significant local flood risk from past and future floods, based on readily available information at the time. The PFRA also included the identification of 'flood risk areas', and outlines the responsibilities of key stakeholders. Local flood risk was defined in the PFRA as flood risk originating from sources other than Main Rivers, the sea and large reservoirs; principally meaning flood risk from surface water runoff, groundwater and Ordinary Watercourses. This main definition of 'local flood risk' was further clarified:

- it includes lakes and ponds;
- it does not consider flooding from sewers unless this is wholly or partly caused by rainwater or other precipitation entering or otherwise affecting the system;
- it does not include flooding from water supply systems (for example burst water mains); and
- it considers the interaction with flooding from main rivers, the sea and sewers.

- 14.2.37 No policies outlined in the PFRA are considered relevant to this Site.

North East Lincolnshire Local Flood Risk Management Strategy (Amec Foster Wheeler, 2016)

- 14.2.38 As the LLFA, NELC is responsible for managing flood risk from 'local' sources. Their Local Flood Risk Management Strategy (LFRMS) report presents the summary of NELC's preferred approach to managing flood risk from the following 'local' sources:

- surface run-off;
- groundwater; and
- ordinary watercourses (generally small rivers and streams).

- 14.2.39 The LFRMS contains a list of objectives for the strategy, which include:

- Objective 1 – to improve the understanding (of both communities and flood risk management partners) of the roles and responsibilities for flood risk management in North East Lincolnshire;
- Objective 2 – to improve the understanding of local flood risk;
- Objective 3 – to reduce the risk of flooding from local sources in the communities;
- Objective 4 – seek to implement flood risk management actions that contribute to wider social, economic and environmental outcomes and sustainable development;
- Objective 5 – create a strong collaborative approach across stakeholders to address risks from all sources of flooding;
- Objective 6 – raise public awareness and engage with local people about local flood risks, and help the communities to manage their own risks;
- Objective 7 – contribute to planning and development decisions to ensure new development is appropriate; and

- Objective 8 – contribute to effective emergency flood response.

14.2.40 The LFRMS refers to the South Humber bank as the ‘energy estuary’, and states that managing flood risk will be important in ensuring that these businesses can operate in a safe environment. Disruption from flooding would otherwise lead to significant disruption which could damage the local economy.

North East Lincolnshire Council SuDS Guide (NELC, 2016)

14.2.41 The NELC SuDS Guide (2016) provides introductory advice on how best to approach the development of SuDS proposals within schemes. The report is designed to reiterate the wide range of industry guidance already available and to highlight the importance of SuDS. It states the aims of SuDS as being to:

- reduce the risk and impacts of flooding;
- remove pollutants from urban runoff at source;
- provide amenity benefits; and
- contribute to improving and enhancing biodiversity.

14.2.42 The guidance also provides information on the criteria needed to support planning application submissions and reiterates that under the NPPF, all major developments must incorporate SuDS and must ultimately succeed in all four of the aims listed above.

14.2.43 The guide acknowledges each site will warrant a different approach to the composition of SuDS applied, dependent on many factors such as, topography, shape, size and underlying permeability. The LPA offers pre-application advice on development proposals, and therefore it is recommended that prior to the detailed design process, the LLFA (NELC) be consulted.

Internal Drainage Board (IDB) Byelaws

14.2.44 IDBs are responsible for managing water levels in the watercourses designated to each IDB and work in partnership with other authorities to actively manage and reduce the risk of flooding within the Board’s district. They have permissive powers under the Land Drainage Act 1991 (UK Parliament, 1991) to undertake maintenance on any watercourse within their district other than ‘Main Rivers’ and to supervise all matters relating to the drainage of land within their districts. Permissive powers mean that IDBs are permitted to undertake works on ordinary watercourses but the responsibility remains with the riparian owner as the IDBs are not obligated to carry out the works. IDBs can undertake works on watercourses outside their drainage district in order to benefit the district. IDBs may make byelaws, approved by the relevant Minister, for securing the efficient working of the drainage systems.

14.2.45 NEL IDB operates in the location of the Site. The following NEL IDB byelaws are relevant to the Proposed Development:

- Byelaw 3 – control of introduction of water and increase in flow or volume of water;
- Byelaw 4 – control of sluices etc.;
- Byelaw 6 – diversion or stopping up of watercourses;
- Byelaw 7 – detrimental substances not to be put into watercourses;
- Byelaw 10 – no obstructions within 7m of the edge of the watercourse;
- Byelaw 15 – banks not to be used for storage;
- Byelaw 16 – not to dredge or raise gravel, sand etc;
- Byelaw 17 – fences, excavations, pipes etc.; and

- Byelaw 18 – interference with sluices.

Environment Agency, Defra and Her Majesty's Government Guidance

14.2.46 The 'Gov.co.uk' website currently provides the following guidance from Defra, the Environment Agency and Her Majesty's Government (HMG):

- Pollution Prevention for Businesses (PPB) (Environment Agency, 2016) - provides details of what businesses and organisations should do at work to avoid pollution incidents, including the permissions need to dispose of waste in England;
- Discharges to surface water and groundwater: environmental permits (Defra and Environment Agency, February 2016) - when an environmental permit to discharge liquid effluent or waste water to surface water or onto the ground is needed, and how to apply;
- Manage water on land: guidance for land managers (Environment Agency, February 2015) - How to manage water use, levels, drainage and irrigation, and avoid pollution from waste water;
- Dispose of business or commercial waste (HMG, 2018);
- Reporting an environmental incident (HMG, 2018);
- Storing oil at your home or business (HMG, 2018);
- Oil storage regulations for businesses (Defra and Environment Agency, May 2015) - how to store oil, design standards for tanks and containers, where to locate and how to protect them, and capacity of bunds and drip trays; and
- Check permission to do work on a river, flood defence or sea defence (HMG, 2018) - in England.

Construction Industry Research and Information Association (CIRIA) Guidance

14.2.47 The CIRIA guidance of relevance to the Proposed Development includes:

- CIRIA C635 Designing for exceedance in urban drainage - good practice (CIRIA, 2006), which provides guidance on site drainage and landscape design to minimise the risk from exceedance flows and any overland flow entering the Proposed Development buildings;
- Guidance C532 - Control of Water Pollution from Construction Sites (CIRIA, 2010), which brings together the Environment Agency guidance but goes into greater detail with regard to sources of water on construction sites, pollutants and pathways. In addition, it provides guidance on planning for the type and location of suitable control measures; and
- Guidance C753 - The SuDS Manual (CIRIA, 2007), which provides best practice guidance on the planning, design, construction, maintenance and operation of SuDS to facilitate their effective implementation within developments.

14.3 Assessment Methodology and Significance Criteria

14.3.1 The framework applied in this assessment of likely significant effects of the Proposed Development on water resources, flood risk and drainage, is the standard Institute of Environmental Management and Assessment State of Environmental Impact Assessment Practice in the UK (IEMA, 2011) methodology. This standard assessment methodology for Environmental Impact Assessments (EIAs) is adopted by the Environment Agency for flood risk management development works and UK water companies when assessing the potential impact of works on the water environment as a whole. Given that the mitigation measures associated with drainage of the Proposed Development will be finalised at the detailed design stage, the assessment has taken a

robust approach by assessing the likely effects prior to mitigation, then a pragmatic and precautionary assessment of the likely residual effects arising from the Proposed Development post mitigation.

14.3.2 As described in Chapter 5: Construction Programme and Management it is noted that there are a number of possible construction programme scenarios still being considered by the Applicant for the Proposed Development. The assessment of construction impacts on water resources, flood risk and drainage is not affected by the start date of the construction period, so the assessment of these impacts are relevant to all three construction programme scenarios, and none of them represents a 'worst case' compared to the others.

14.3.3 The assessment has considered all of the potential water resource receptors as shown on Figure 14.1 in PEI Report Volume II and consists of the following sequential elements:

- description of the baseline conditions for water resources, flood risk and drainage in order to characterise the current environment;
- forecasting of the potential future baseline conditions;
- evaluation of the likely significant effects on water resources, flood risk and drainage during the construction, operation and maintenance operational phases of the Proposed Development;
- identification of specific mitigation measures to protect water resources from flood risk and protect drainage; and
- evaluation of the likely residual effects on water resources, flood risk and drainage after the implementation of specific mitigation measures.

Significance of Effects Criteria

14.3.4 The assessment of the impacts of the Proposed Development on water environment receptors considers how sensitive the receptors in the vicinity may be to changes in conditions arising from the Proposed Development. Three sets of criteria are considered in this assessment, which adopts the IEMA (2011) approach:

- a) characterising the importance of the receptor – in terms of sensitivity and value;
- b) determining the nature of the impacts and effects – in terms of magnitude, probability, reversibility and duration; and
- c) classifying the significance of the effects of the Proposed Development with reference to the importance of the receptor and the nature of the impact.

14.3.5 The IEMA (2011) approach identifies that the most common methodology used to evaluate significance of an effect is to compare the sensitivity, value and importance of the receiving environment (the receptor sensitivity and value) with the nature of the predicted effect (magnitude, probability, reversibility and duration).

Characterising the Importance of the Receptor

14.3.6 The evaluation of a receptor's importance takes into account quality, scale, rarity and substitutability where:

- quality is a measure of the physical condition of the attribute;
- scale requires consideration of the geographical scale at which the attribute matters to both policy makers and stakeholders, at all levels;
- rarity requires consideration of whether the water feature is commonplace or scarce, at the scale at which it matters; and

- substitutability requires consideration of whether water attributes are replaceable over a given time frame.

14.3.7 The assessment of the value and importance of the receptor is based on their purpose and use – from flood defence and drainage to nature conservation designations reflecting ecological value and other ecosystem services such as recreation and abstraction/ discharges reflecting human value. These sensitivities and values in the context of Water Resources, Flood Risk and Drainage are defined in Table 14.1. The receptor flood risk vulnerability classifications to development are based upon those defined in Table 2 of the PPG.

Table 14.1: Criteria for characterising the importance of the receptor (based upon IEMA 2011 guidance)

RECEPTOR IMPORTANCE	SENSITIVITY	VALUE
High	High vulnerability to temporary or permanent changes to water resource (including water quality, abstractions, discharges and pollution incidents), hydrology, flood risk and drainage	<p>Water resources: Watercourse having a WFD classification as shown in a River Basin Management Plan (River Basin Management Plan (RBMP)), and Q95 < 1.0 m³/s; Principal Aquifer (not within SPZ 1) [Cyprinid or Salmonid fishery]</p> <p>Water abstraction: 500-1,000 m³/ day</p> <p>Receptors to flood risk: 'more vulnerable' development</p> <p>Receptors to drainage: 'more vulnerable' development</p> <p>Other key considerations: Designated for relevant environmental features at international (Special Protected Area, Special Area of Conservation or Ramsar Site) or national level (Site of Special Scientific Interest, National Nature Reserve or equivalent)</p> <p>Use: Frequently used by people e.g. for recreation, abstraction. WFD Drinking Water Protected Area</p>
Medium	Medium vulnerability to temporary or permanent changes to water resource (including water quality, abstractions, discharges and pollution incidents), hydrology, flood risk and drainage	<p>Water resources: Watercourse detailed in the Digital River Network but not having a WFD classification as shown in a RBMP; Secondary Aquifer</p> <p>Water abstraction: 50-499 m³/ day</p> <p>Receptors to flood risk: 'less vulnerable' development*</p> <p>Receptors to flood risk: 'more vulnerable' development*</p> <p>Receptors to drainage: 'more vulnerable'</p>

RECEPTOR IMPORTANCE	SENSITIVITY	VALUE
		<p>development*</p> <p>Other key considerations: Designated for relevant environmental features at regional (e.g. Sites of Metropolitan Importance) or district level (e.g. Local Nature Reserves)</p> <p>Use: Occasionally used by people e.g. for recreation, abstraction</p>
Low	Low vulnerability to temporary or permanent changes to water resource (including water quality, abstractions, discharges and pollution incidents), hydrology, flood risk and drainage	<p>Water resources: Surface water sewer, agricultural drainage ditch; non-aquifer</p> <p>Water abstraction: <50 m³/ day</p> <p>Receptors to flood risk: 'water compatible' development</p> <p>Receptors to drainage: 'water compatible' development</p> <p>Other key considerations: Not designated for relevant features, but may contain habitats or populations assemblages of species that appreciably enrich the local habitat resource (e.g. species rich hedgerows, ponds)</p> <p>Use: Infrequently used by people e.g. for recreation, abstraction</p>
Negligible	Negligible vulnerability to temporary or permanent changes to water resource (including water quality, abstractions, discharges and pollution incidents), hydrology, flood risk and drainage	<p>Water resources: Surface water sewer, agricultural drainage ditch; non-aquifer</p> <p>Water abstraction: <50 m³/ day</p> <p>Receptors to flood risk: 'water compatible' development</p> <p>Receptors to drainage: 'water compatible' development</p> <p>Other key considerations: Not designated for relevant features</p> <p>Use: Not used by people e.g. for recreation, abstraction</p>

Evaluation of the Nature of the Effects

14.3.8 The assessment framework takes into consideration a wide range of impacts that may be incurred as a result of the Proposed Development. The potential nature of an impact of the Proposed Development is considered as high, medium, low or negligible based

on the criteria set out in Table 14.2. The nature of the impact and its effect is considered separately and collectively in terms of the magnitude, probability, reversibility, duration and direction of the impact of the Proposed Development. In this approach, the 'magnitude' includes the spatial extent of the effect; the 'probability' refers to the time period over which the effect will likely reoccur; and consideration is given to whether the effect is permanent or reversible. Closer proximity of the receptor to the Site increases the likelihood of direct and indirect impacts on hydrology and water quality.

- 14.3.9 Impacts may be adverse or beneficial, depending on the circumstances. They are quantified where practicable and the degree or magnitude of impact is assessed on a qualitative scale, to facilitate comparison with impacts on other environmental receptors.
- 14.3.10 In the context of the Proposed Development, short-term effects are considered to be those associated with construction or decommissioning, and which cease when construction/ decommissioning works are completed; long-term effects are those associated with the Proposed Development once completed and operational and which last for the life of the Proposed Development during operation and periods of maintenance. Effects may be permanent (irreversible) or temporary (reversible) and direct or indirect as well as adverse or beneficial.
- 14.3.11 After specific mitigation measures have been set out, the residual significance of the effects is re-assessed using the same criteria.

Table 14.2: Criteria for determining the nature of effect

NATURE OF EFFECT	MAGNITUDE OF EFFECT	PROBAB-ILITY	REVERSIB-ILITY	DURATION
High	<p>Large-scale (regional to waterbody) effects on flows, water resources, water levels and/ or wetted areas, with flood risk and drainage significantly influenced outside their normal operating envelope.</p> <p>Large-scale (regional to waterbody) effects on the river channel, banks or sediment dynamics, which are likely to have a consequent effect on watercourse hydrodynamics.</p> <p>Large-scale (regional to waterbody) effects on water quality, which affects suitability of the water quality to support Good or High ecological status.</p>	High likelihood of direct effects on water resources, flood risk, drainage, hydrology and water quality	Effects on water resources, flood risk, drainage, hydrology and water quality are irreversible	Long term effects on water resources, flood risk, drainage, hydrology and water quality
Medium	Medium-scale (local to waterbody) changes to flows, water resources, water levels and/ or wetted areas, with flood risk and	Medium likelihood of direct effects OR high likelihood of	Effects on water resources, flood risk, drainage,	Medium term effects on water resources, flood risk,

NATURE OF EFFECT	MAGNITUDE OF EFFECT	PROBAB-ILITY	REVERSIB-ILITY	DURATION
	<p>drainage.</p> <p>Medium-scale (local to waterbody) effects on the river channel, banks or sediment dynamics, such as changes to erosional and depositional character that have a limited influence on channel function.</p> <p>Medium-scale (local to waterbody) effects on water quality, but not predicted to lead to deterioration in ecological status.</p>	indirect effects on water resources, flood risk, drainage, hydrology and water quality	hydrology and water quality are partially reversible	drainage, hydrology and water quality
Low	<p>Small-scale (up to local) changes on flows, water resources, water levels and/ or wetted areas, with flood risk and drainage, within their normal operating envelope.</p> <p>Small-scale (up to local) effects on the river channel, banks or sediment dynamics, with little or no consequent effects on watercourse hydrodynamics.</p> <p>Small-scale (up to local) effects on water quality, within the usual variability for the Site.</p>	Low likelihood of direct effects OR medium likelihood of indirect effects on water resources, flood risk, drainage, hydrology and water quality	Effects on water resources, flood risk, drainage, hydrology and water quality are mostly reversible	Short term effects on water resources, flood risk, drainage, hydrology and water quality
Negligible	<p>Little or no changes on flows, water resources, water levels and/ or wetted areas, with flood risk and drainage</p> <p>Little or no effects on the river channel, banks or sediment dynamics.</p> <p>Little or no effects on water quality.</p>	Low likelihood of direct or indirect effects on water resources, flood risk, drainage, hydrology and water quality	Effects on water resources, flood risk, drainage, hydrology and water quality are fully reversible	At most temporary effects on water resources, flood risk, drainage, hydrology and water quality
	DIRECTION			
Adverse	Negative effects on water resources, flood risk, drainage, hydrology and water quality available for use by people and wildlife			
Beneficial	Positive effects on water resources, flood risk, drainage, hydrology and			

NATURE OF EFFECT	MAGNITUDE OF EFFECT	PROBAB- ILITY	REVERSIB- ILITY	DURATION
	water quality available for use by people and wildlife			

Assessment of the Significance of the Effects

14.3.12 Overall, effects have been assessed in terms of the importance of the receptor (see Table 14.1) and the magnitude of change (see Table 14.2). This is described for the construction, operation (including maintenance) and decommissioning phases, prior to the implementation of mitigation. The approach of this assessment is then to assess and evaluate the significance of these effects on the receptors.

14.3.13 The classification of the significance of effects (adapted from IEMA, 2011) can be summarised as:

- **Negligible** - imperceptible effects to the water environment for a receptor;
- **Minor** - a limited, very short or highly localised effect on a water receptor of high or medium importance, or a wide extent or long duration effect on a water receptor of low quality/ importance. A minor effect would not prevent compliance with legislation, standards or policy for water resources, flood risk; drainage or water quality;
- **Moderate** - a local scale medium magnitude of change on a water resource of high quality; or a large (reversible) effect on a water resource of medium quality/ importance. A moderate effect would not affect the long-term status of a water receptor complying with compliance with legislation, standards or policy for water resources, flood risk; drainage or water quality; or
- **Major** - a magnitude of change on a water resource of high quality/ importance resulting in a deterioration of water receptor status; preventing compliance with legislation, standards or policy for water resources, flood risk; drainage or water quality.

Table 14.3: Classification of the significance of the effects (adapted from Figure 6.3 in IEMA, 2011)

		RECEPTOR IMPORTANCE			
		HIGH	MEDIUM	LOW	NEGLIGIBLE
NATURE OF EFFECT	HIGH	Major	Major	Moderate or Minor	Negligible
	MEDIUM	Major	Moderate	Minor	Negligible
	LOW	Moderate or Minor	Minor	Negligible	Negligible
	NEGLIGIBLE	Negligible	Negligible	Negligible	Negligible

14.3.14 In the IEMA (2011) guidance (see 'Figure 6.3 EIA significance evaluation matrix' on page 61 of the guidance report), a 'major' effect is equivalent to 'very substantial/ substantial', a 'minor' effect is equivalent to 'slight', and a 'negligible' effect is equivalent to 'not significant'. Adapted classifications are presented in Table 14.3 to allow comparison with the other EIA topics.

14.3.15 Major and moderate effects are considered to be significant for the purposes of EIA. If a major adverse or moderate adverse effect were to be identified, then mitigation measures would be developed to reduce or mitigate this effect. After specific mitigation measures have been set out (see Section 14.7), the residual effects are assessed using the same criteria (see Table 14.3).

14.3.16 It should be noted that these criteria form a starting point to guide decisions on the significance of effects. Decisions have been based on professional judgment.

Sources of Information/ Data to Establish Baseline

14.3.17 In order to identify and characterise the surface water receptors within the Study Area considered as part of this assessment, available data on surface water quality and quantity within the vicinity of the Site have been obtained.

14.3.18 A number of sources of information and websites have been consulted, as summarised in Table 14.4.

Table 14.4: Sources of Information

PURPOSE	SOURCE	COMMENTS
Identification of Hydrological Features	1:10,000 Ordnance Survey (OS) mapping Environment Agency 1 m resolution LiDAR data	Identifies the location of local hydrological features and provides topographic elevations.
Identification of Land Use	StreetCheck (StreetCheck, 2019)	Identifies the type of land use.
Identification of Existing Flood Risk	1:10,000 OS mapping	Provides indicative ground levels of the Site and surrounding area.
	Environment Agency Flood Map for Planning ¹ (Environment Agency, 2019)	Identifies fluvial/ tidal inundation extents.
	Environment Agency Flood Risk from Surface Water Map (Environment Agency, 2019)	Identification of flood risk from surface water runoff from land.
	Environment Agency Flood Risk from Reservoirs Map (Environment Agency, 2019)	Provides information on the risk of flooding from reservoirs (artificial sources).
	Environment Agency Groundwater Vulnerability map (Defra, 2019)	Identification of groundwater vulnerability designations.
	British Geological Survey (BGS) records & Soilsmap	Provides details of geology (bedrock and superficial deposits),

¹ See Annex 1 of the FRA in Appendix 14A in PEI Report Volume III

PURPOSE	SOURCE	COMMENTS
	Map (Cranfield Soil and Agrifood Institute, 2019)	soil type and hydrogeology in the vicinity of the Site.
	North and North East Lincolnshire Strategic Flood Risk Assessment (SFRA) and Addendum	Assesses local flood risk from fluvial/ tidal, sewers, overland flow, groundwater and artificial sources.
	North East Lincolnshire Preliminary Flood Risk Assessment (PFRA)	Indicative risk of flooding from the local drainage system and minor watercourses
	Grimsby and Ancholme Catchment Flood Management Plan (CFMP)	Outlines flood risk sources within the plan area and how these may be managed in the future.
	Flamborough Head to Gibraltar Point Shoreline Management Plan (SMP)	Outlines the proposals for how the tidal flood risk in the area will be managed by the Environment Agency in the future.
Identification of Historical Flooding	<p>North and North East Lincolnshire Strategic Flood Risk Assessment (SFRA) and Addendum</p> <p>North East Lincolnshire Preliminary Flood Risk Assessment (PFRA)</p> <p>North East Lincolnshire Local Flood Risk Management Strategy (LFRMS)</p>	Details of historical flooding and local flooding records.
Details of Proposed Development	Indicative Layout Drawings (see Figure 4.1 in PEI Report Volume II)	Provides the layout of the Proposed Development.
Surface Water Drainage Plans	<p>1:10,000 OS Mapping</p> <p>Existing Site Drainage Plans (included within Appendix 14B (Outline Drainage Strategy) in PEI Report Volume III)</p>	Identifies existing site drainage, public drainage system near the Site and details of existing surface water runoff from the Site.

Consultation Summary

14.3.19 Consultation undertaken with statutory consultees to inform the assessment for the Consented Development and the Proposed Development, including a summary of comments raised through the formal EIA Scoping Opinion for the Proposed Development (see Appendix 1B in PEI Report Volume III). The consultation response from NELC to PINS explained that the EIA Scoping Report captured the relevant information requested by NELC in the scoping opinion in respect of the Consented

Development and that NELC have no further comments. Consultation comments received for the Consented Development are considered to be relevant to the Proposed Development and therefore a summary of all consultation comments received to date for the Consented Development and Proposed Development is presented in Table 14.5.

Table 14.5: Consultation summary

CONSULTEE	DATE	SUMMARY OF RESPONSE	HOW COMMENTS HAVE BEEN ADDRESSED IN CHAPTER
Environment Agency	Letter response to NELC on 03/08/18 (EA Ref. AN/2018/127 698/01-L01) and follow up telephone conversation 06/11/18 regarding Consented Development assessment.	Consented Development: The proposed content of the EIA is considered appropriate in relation to issues within Environment Agency remit, which include flood risk.	The EIA for the Consented Development included assessment of water resources, flood risk and drainage. The assessment has been updated for the Proposed Development and the interim assessment is presented in this chapter of the PEI Report.
		Advice was provided by the Environment Agency on the Environmental Permitting required for the Consented Development.	An Environmental Permit application for the operation of the Consented Development was submitted to the Environment Agency in early 2019. A variation will be required for the Proposed Development.
		Advice was provided by the Environment Agency on the requirements of the FRA for the Consented Development.	The FRA for the Consented Development considered all sources of flooding, and demonstrated that the Consented Development will be safe for its lifetime, without increasing risk elsewhere, and where possible, reducing flood risk overall. The FRA has been updated for the Proposed Development (see Appendix 14A in PEI Report Volume III), incorporating additional data provided by the Environment Agency in October 2019.
Environment Agency	Email responses to AECOM's request for updated data to inform the	Proposed Development: The Environment Agency confirmed that there has been no change to the baseline data since the original request in June	The assessment has been updated to reflect the peak flood water level as defined by the hydraulic model results from the Northern Area Tidal

CONSULTEE	DATE	SUMMARY OF RESPONSE	HOW COMMENTS HAVE BEEN ADDRESSED IN CHAPTER
	Proposed Development assessment and the FRA 30/09/2019 and 10/10/2019.	2018. The peak flood water level for the Site from the Northern Area Tidal Modelling study was provided (having not previously been available to inform the Consented Development assessment).	Modelling study, provided by the Environment Agency in October 2019.
		Reconfirmation of the requirement for raising critical equipment above the 2115 0.1% (1 in 1000) modelled breach level.	The assessment has been updated to refer to the peak flood water level for the Site (4.60 m Above Ordnance Datum) provided on 10/10/19. This is only 0.05 m higher than was estimated for the Consented Development FRA from the provisional data provided by the EA.
Environment Agency	Letter response to the Planning Inspectorate dated 17/09/2019 (EA ref. AN/2019/129 417/01-L01) within Appendix 2 of the EIA Scoping Opinion received 2/10/19.	Proposed Development: Advice provided relating to permissions that must be obtained from the Environment Agency for any proposed activities which will take place over, on or within 8 m of a flood defence structure, culvert or Main River within the floodplain, and within 16 m of a sea defence.	No such work is included in the proposals in the vicinity of Main Rivers, culverts, river or sea defences so no additional permissions or mitigation is required.
North East Lindsey Internal Drainage Board	Letter response to NELC on 10/08/18	Consented Development: Confirmation from NEL IDB that the LPA will require a proposed scheme for the provision, implementation and future maintenance of a surface water drainage system for the Consented Development.	Outline Drainage Strategy submitted as part of the ES for the Consented Development.
		Confirmation that NEL IDB supports the use of SuDS and the drainage	SuDS have been integrated into the Consented Development

CONSULTEE	DATE	SUMMARY OF RESPONSE	HOW COMMENTS HAVE BEEN ADDRESSED IN CHAPTER
		policies of NELC.	outline drainage design, and subsequently into the design for the Proposed Development.
		Guidance that although any discharge should be limited to the greenfield rate, Middle Drain Pump Station was designed to allow for areas of development. Any potential increase in discharge arising from the Proposed Development would be subject to the drainage system being able to convey the flows (modelling required) and a development charge payable to NEL IDB.	Discharge will be limited to the greenfield runoff rate.
North East Lindsey Internal Drainage	Email response to the Planning Inspectorate dated 13/09/2019 (NEL IDB ref. EN010107) within Appendix 2 of the EIA Scoping Opinion received 2/10/2019.	Proposed Development: Under the terms of the Land Drainage Act 1991 the prior written consent of NEL IDB is required for any proposed temporary or permanent works or structures within any watercourse including infilling or a diversion.	Prior approval will be sought for any structures or permanent works within watercourses.
		As the Site is located in Flood Zone 3 on the Environment Agency Flood Map for Planning, appropriate mitigation should be included in the Drainage Strategy.	Consideration of restricted discharges from Land Drain 1 (into which the attenuation pond may outfall) due to high tide levels at the tidal outfall from Middle Drain given in the Outline Drainage Strategy in Appendix 14B of the PEI Report Volume III. Sufficient storage will be provided in the attenuation pond on Site to accommodate the potential that no discharge may be allowed during a storm event.
North East Lincolnshire	Letter response to	Consented Development:	SuDS have been integrated into the

CONSULTEE	DATE	SUMMARY OF RESPONSE	HOW COMMENTS HAVE BEEN ADDRESSED IN CHAPTER
Council	NELC on 10/08/18	The Consented Development will require sustainable surface water drainage techniques to be used.	Proposed Development outline design.
		The Consented Development is not to be commenced until a scheme for the provision of surface water drainage works has been approved in writing by the Local Planning Authority.	An Outline Drainage Strategy was submitted as part of the ES for the Consented Development, demonstrating the prevention of increased risk of flooding by ensuring the provision of a satisfactory means of surface water disposal.
Anglian Water	Letter response to the Planning Inspectorate dated 18/09/2019 (AW ref. EN010107) within Appendix 2 of the EIA Scoping Opinion received 02/10/2019.	Consented Development: Clarify what the requirement for wastewater services during the construction phases of the Consented Development. Recommendation that reference is made to the existing foul sewerage networks and sewerage treatment.	Pre-application discussions have been undertaken with Anglian Water regarding the anticipated operational foul drainage requirements. Chapter 4: The Proposed Development identifies two options for the management of foul drainage – tankering off Site or discharge to a foul sewer. The preferred option will be confirmed at the detailed design stage.
		The use of sustainable drainage systems for the Consented Development was encouraged.	SuDS have been integrated into the Consented Development and the Proposed Development drainage strategies.
		Early engagement with Anglian Water recommended in order to address any foul water infrastructure issues.	As above, pre-application discussions have been undertaken with Anglian Water regarding the anticipated operational foul drainage requirements.
		Proposed Development: Consideration should be given to all potential sources of flooding - including foul drainage, sewage treatment and	All sources of flooding (except for foul drainage at this stage) are considered in the FRA at Appendix 14A of the PEI Report Volume III and within the

CONSULTEE	DATE	SUMMARY OF RESPONSE	HOW COMMENTS HAVE BEEN ADDRESSED IN CHAPTER
		water services.	Outline Drainage Strategy in Appendix 14B of the PEI Report Volume III. Consideration of foul drainage sources of flood risk will be made in the final FRA.
		Reconfirmation that Anglian Water fully supports the use of SuDS as an alternative to discharging surface water to the public sewerage network and welcome further details of the proposed method of surface water disposal including the SuDS attenuation feature being provided for comment.	SuDS have been integrated into the Proposed Development drainage strategy.

14.4 Baseline Conditions

Site Description

- 14.4.1 An overview of the Site and surroundings is provided in Chapter 3: Description of the Proposed Development Site and a detailed description of the Proposed Development is provided in Chapter 4: The Proposed Development. In the context of the water resources, flood risk and drainage, an overview of the Site and surrounding area is presented below and sensitive receptors within the water environment are identified.
- 14.4.2 The Site is located in Flood Zone 3a (as shown on the Flood Map for Planning (Rivers and Sea)). Flood Zone 3 is land that has a 1 in 100 or greater annual probability of river flooding (1% Annual Exceedance Probability (AEP)); or land that has a 1 in 200 or greater annual probability (0.5% AEP) of sea flooding. However, the Site benefits from the presence of tidal flood defences along the south bank of the Humber Estuary which are maintained by the Environment Agency.
- 14.4.3 The Main Development Area of the Site (as shown on Figure 14.1), measuring approximately 7 ha, is located to the east of the existing South Humber Bank Power Station (SHBPS) and to the west of the cooling water pumping station. The Main Development Area currently comprises a vegetated area through which passes the underground water cooling pipes connecting the South Humber Bank Power Station and the cooling water pumping station and associated access road. Although OS mapping shows two man-made ponds within the Main Development Area (see Figure 14.1), these have recently been drawn down and infilled.
- 14.4.4 NEL IDB manages the wider land drainage ditch system in close proximity to the Site. As shown on Figure 14.1 in PEI Report Volume II, in addition to the Humber Estuary to the east of the Site there are two other watercourses (Middle Drain and Oldfleet Drain) along with multiple land drains, within the vicinity. Oldfleet Drain flows north-east discharging into the Humber Estuary to the south-east of the Site. Middle Drain also flows north-east and is located to the north-east of Site. Drainage ditches run along the northern, western and southern perimeters of the Site.

Water Resources

Hydrology and Flood Risk Management Infrastructure

- 14.4.5 The nearest watercourse is Oldfleet Drain located approximately 140 m to the south of the Site (at its closest point) which is classed by the Environment Agency as a Main River. Middle Drain, an Ordinary Watercourse, is located approximately 340 m to the north of the Site (at its closest point). A series of minor land drainage ditches (also Ordinary Watercourses) run along the northern, western and southern boundaries of the Site (and to the east of the Site) and convey surface water runoff discharges from the greenfield areas of the Site into Middle Drain and Oldfleet Drain towards the Humber Estuary.
- 14.4.6 Fluvial flood defences are present along Oldfleet Drain upstream of the Site, located approximately 270 m south-west, upstream of the railway line (see Figure 14.1 in PEI Report Volume II). According to the information provided by the Environment Agency, these reduce the risk of flooding up to a 1% AEP (1 in 100 chance) event. However, alongside the Site (downstream of the railway line to the sea), no formal defences are present.
- 14.4.7 Middle Drain discharges via a pumping station located approximately 550 m north of the Site, and Oldfleet Drain that outfalls via a flapped culvert into the Humber Estuary approximately 450 m south-east of the Site. The tidal outfall of Oldfleet Drain comprises a flapped twin culvert through the raised coastal flood defence that enables runoff to discharge whilst tide levels are low enough and the flaps are open. Two additional outfalls from a land drain alongside the raised sea defence between the Site and the Middle Drain pumping station comprise two 150 mm diameter un-flapped pipes.
- 14.4.8 The Environment Agency's 'Flood Map for Planning' (see Annex 1 of the FRA in Appendix 14A in PEI Report Volume III) identifies there to be existing tidal flood defences located approximately 160 m to the east of the Site (175 m to the east of the Main Development Area), extending from north-west to south-east alongside the Humber Estuary, which reduce the risk of flooding up to a 0.5% AEP (1 in 200 chance) event.

Surface Water Quality – Waterbody

- 14.4.9 The classification of waterbodies is reported in the 2015 cycle of the River Basin Management Plans (RBMP) (Defra and Environment Agency, 2015). The Humber RBMP assesses the pressures facing the water environment in the Humber river basin district and lists actions to address them. The Humber RBMP is in the second iteration of a series of six-year planning cycles and will be updated in 2021.
- 14.4.10 Some surface water bodies are designated as 'artificial' or 'heavily modified'. This is because they may have been created or modified for a particular use such as water supply, flood protection, navigation or urban infrastructure.
- 14.4.11 According to the Humber RBMP, by definition, artificial and heavily modified waterbodies are not able to achieve natural conditions. Instead the classification and objectives for these waterbodies, and the biology they represent, are measured against 'ecological potential' rather than status. For an artificial or heavily modified waterbody to achieve good ecological potential, the chemistry must be good. Chemical status is assessed by compliance with the environmental standards for chemicals that are listed in the Priority Substances Directive 2008/105/EC, which is a 'daughter' directive of the WFD. Chemical status is recorded as either 'good' or 'fail', in terms of whether the chemical status is compliant with environmental standards.
- 14.4.12 In addition, any modifications to the structural or physical nature of the waterbody that harm biology must only be those essential for its valid use. All other such modifications must have been altered or managed to reduce or remove their adverse impact, so that

there is the potential for biology to be as close as possible to that of a similar natural waterbody. Often though, the biology will still be impacted and biological status of the waterbody may be less than good. The ecological status takes into account physio-chemical elements, biological elements and specific pollutants.

- 14.4.13 The Site is located 175 m from the Humber Estuary at its closest point. At this location the Humber is classified under the Water Framework Directive as an Estuarine and Coastal Water Body (GB 530402609201- Humber Lower). In the 2016 River Basin Management Plan cycle, the Humber Lower has an overall waterbody classification of 'Moderate' potential. The reasons cited for the continued failure of the water body to meet its WFD objectives include disproportionate cost and technical infeasibility.

Surface Water Quality – Waterbody - Local Land Drains adjacent to the Site

- 14.4.14 The local land drains located directly within and adjacent to the boundary of the Site are not classified under the WFD and no water quality information is provided within the Humber RBMP. The Environment Agency and the NEL IDB does not currently hold any water quality data for any of these local land drains.
- 14.4.15 Given that the surface water features are not detailed in the Digital River Network and do not have a WFD classification as shown in the Humber RBMP (Defra and Environment Agency, 2015) these features are considered to be water resource receptors of low importance with respect to water quality.

Topography

- 14.4.16 A review of 1 m resolution LiDAR data published by the Environment Agency (2017) identified that the Site is situated on land with levels ranging between 1.90 m Above Ordnance Datum (mAOD) and 4.25 mAOD, but the majority of the Site is generally flat and on average, in the region of 2 mAOD. The levels of the Site gently fall from west to east, towards the Humber Estuary.

Geology and Groundwater

- 14.4.17 The British Geological Survey, Geology of Britain Viewer (BGS, 2019) was used to identify the bedrock and superficial deposits beneath the Site. The Superficial Deposits present beneath the Site are identified as tidal flat deposits (clay and silt) underlain by Glacial Deposits. These are designated as unproductive strata with low permeability; however permeable sand layers are likely to contain groundwater.
- 14.4.18 The bedrock underlying the Site is the Flamborough Chalk Formation and is designated as a 'Principal Aquifer', defined as "*layers of rock or drift deposits that...usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale*" (BGS, 2019). Available groundwater monitoring data indicates that groundwater within the chalk is likely to be confined beneath the overlying low-permeability superficial deposits.
- 14.4.19 There are no reported geological faults identified beneath the Site.
- 14.4.20 Soils at the Site are described on the Cranfield Soil and Agrifood Institute's Soilscape mapping website as "*loamy and clayey soils of coastal flats with naturally high groundwater*" (BGS, 2019).
- 14.4.21 The Site is not located within an Environment Agency designated groundwater Source Protection Zone (SPZ) (Environment Agency, 2019).
- 14.4.22 The Site is located in an area defined as a 'Principal Aquifer – High' vulnerability category on the Environment Agency's Groundwater Vulnerability Map (Environment Agency, 2019).
- 14.4.23 Further details on geology and ground conditions are provided in Chapter 12: Geology, Hydrogeology and Contaminated Land.

14.4.24 These classifications will be taken into account in detail when the proposed surface water runoff mitigation measures are developed further at the detailed design stage.

Sensitive Water Resource, Flood Risk and Drainage Receptors

14.4.25 This section presents the baseline water resources, flood risk and drainage baseline evidence for the Study Area identifying sensitive receptors and environmental conditions that could be influenced by the Proposed Development. Baseline conditions in terms of water resources, flood risk, and drainage are outlined for the Site.

14.4.26 The key watercourses associated with the Site are summarised below and shown in Figure 14.1 as presented in the PEI Report Volume II:

- the Humber Estuary -
 - located approximately 175 m to the east of the Site,
 - connectivity between the Site and the Humber Estuary is via a pumping station (Middle Drain) and a flapped outfall (Oldfleet Drain) which are located approximately 550 m and 450 m from the Site;
- Oldfleet Drain -
 - 5 km long and 3 m wide,
 - flows north-west discharging into the Humber Estuary, south-east of Site, and
 - flows through agricultural fields and industrial land uses;
- Middle Drain -
 - 3 km long and 12.8 m wide,
 - flows north-west discharging into the Humber Estuary through Middle Pumping Station to the north-west of Site, and
 - flows through agricultural fields and industrial land uses;
- Land Drain 1 -
 - 1.1 km long and 5 m wide,
 - flows north-east along the northern boundary of Site;
- Land Drain 2 -
 - 1.6 km long and 3 m wide,
 - flows south along the western boundary of Site and east along the southern boundary of Site before discharging into the Land Drain 3 to the east of the Site, which discharges into the Humber Estuary via Middle Drain Pumping Station;
- Land Drain 3 -
 - 1.2 km long and 4 m wide,
 - flows north-west along the Humber Estuary coastline to the east of Site, and
 - flows through agricultural fields and adjacent to the raised flood defences;
- Land Drain 4 -
 - 0.4 km long and 3 m wide,
 - transports flow from the northern boundary of the Site northwards, discharging into Middle Drain, and
 - flows through agricultural fields adjacent to industrial land uses;

- Land Drain 5 -
 - 0.38 km long and 3 m wide,
 - transports flow from the northern boundary of Site north discharging into Middle Drain, and
 - flows through agricultural fields;
- Land Drain 6 -
 - 0.8 km long and 3.8 m wide,
 - flows south to the west of Site adjacent to the western side of Hobson Way discharging into Oldfleet Drain, and
 - flows through an unused and overgrown area.

Surface Water Abstractions

14.4.27 Information from the Envirocheck Report (see Appendix 12A in PEI Report Volume III) indicates there are two abstractions for water within a 0.5 km radius of the Site, in addition to the SHBPS cooling water abstraction from the Humber Estuary. The first is for cooling by Humberland Ltd from an unidentified stream (but temporary in status). The second is by NELC and is from Oldfleet Drain for Non-remedial River/ Wetland Support (a transfer between sources). The potential impacts on surface water abstractions are therefore not taken into account when describing the baseline conditions for the Proposed Development.

Discharges to Surface Water

14.4.28 Information from the Envirocheck Report (see Appendix 12A in PEI Report Volume III) indicates there are six Licensed Discharge Consent records within a 0.5 km radius of the Site in addition to the SHBPS cooling water discharge to the Humber Estuary. All six are for trade effluent, trade discharge (process water) and a sewage discharge for treatment/ final effluent. Four of these licences are listed as 'revoked' with the status of the remaining two unknown. Two are for Middle Drain. The potential impacts on discharge to surface water are therefore not taken into account when describing the baseline conditions for the Proposed Development as there is no hydrological connection with the Site.

Point Source Pollutants

14.4.29 Pollution incidents are classified by the Environment Agency on the degree of Environment Agency manpower deployed (i.e. large, small) and likely environmental impact with regard to air, water and land. Incidents are classified as Category 1 (defined as major), Category 2 (significant), Category 3 (minor) or Category 4 (insignificant).

14.4.30 Information from the Envirocheck Report (see Appendix 12A in PEI Report Volume III) indicates there have been no Category 1 (major) and no Category 2 (significant) incidents within 500 m of the Site within the last 20 years that have the potential to affect water receptors. The last two known pollution incidents occurred in 1992 with the locations and sources of the pollution also unknown. Lower category recorded incidents are not considered serious enough to have affected current baseline water quality, either temporarily, or in the long-term; either due to the historical nature of the incident or the classified category. Therefore, they are not taken into account when describing the baseline conditions for the Site.

Non-Point Source Pollutants

14.4.31 Within the study area, urban, industrial and commercial and agricultural runoff may enter the identified watercourses and may affect the status of such watercourses.

Flood Risk

14.4.32 The FRA prepared for the Proposed Development (Appendix 14A in PEI Report Volume III) presents in detail the assessment of flood risks from all sources both to, and as a result of the Proposed Development. The following sections present a summary of its findings.

Tidal Sources

14.4.33 The Humber Estuary is located approximately 175 m to the east of the Site. The Humber Estuary poses the primary and most significant risk of flooding to the Site.

14.4.34 The Environment Agency's 'Flood Map for Planning' (see Annex 1 of the FRA in Appendix 14A in PEI Report Volume III) identifies areas subject to fluvial/ tidal flood risk for the present day but does not include the benefits or impacts of any existing flood defences or climate change respectively. The 'Flood Map for Planning' illustrates that the Site is wholly located within Flood Zone 3 ('high' risk) defined as land having a >0.5% AEP (greater than a 1 in 200 chance) of sea flooding.

14.4.35 In accordance with the NPPF, the requirements are to ensure any proposed developments are built to withstand tidal flooding up to a 1% AEP (1 in 100 chance) event taking into account the potential impacts of climate change. The Environment Agency's 'Flood Map for Planning' identifies there to be existing tidal flood defences located approximately 160 m to the east of the Site, extending from north-west to south-east alongside the Humber Estuary, however as mentioned it does not take into account their benefits.

14.4.36 According to data provided by the Environment Agency for the Consented Development and following a check to verify its validity for the Proposed Development EIA (see Annex 1 of the FRA in Appendix 14A in PEI Report Volume III), the tidal defences protecting this Site consist of concrete floodwalls. They are in 'good' condition and reduce the risk of flooding up to a 0.5% AEP (1 in 200 chance in any year) event. The Environment Agency inspects these defences routinely to ensure potential defects are identified. The residual risk of flooding in the event of a defence breach scenario has been considered in the FRA.

14.4.37 Based on the information provided by the Environment Agency, it has been determined through the FRA that during the existing baseline scenario the Site is at a 'low' risk of flooding from tidal sources with the defences in place, or resulting from overtopping of the defences during events that exceed a 0.5% AEP (1 in 200 chance) of flooding. If the defences were to fail and breach during the existing scenario, the Site would be at a 'high' risk of flooding during either the 0.5% or 0.1% AEP (1 in 1000 chance) events.

Fluvial Sources

14.4.38 The nearest watercourse is Oldfleet Drain (Main River) located approximately 140 m to the south of the Site (at its closest point) which flows in a north-easterly direction. Middle Drain is classified by the NEL IDB as a Significant Ordinary Watercourse as defined by the SFRA, is managed by the NEL IDB and is located approximately 340 m to the north (at its closest point). A series of minor land drainage ditches (also Ordinary Watercourses) run along the northern, western and southern boundaries of the Site and to the east of the SHBPS site, and convey surface water runoff discharges from the greenfield areas of the Site to Oldfleet Drain and Middle Drain. These watercourses all pose a potential risk of fluvial flooding to the Site.

14.4.39 The Environment Agency's 'Flood Map for Planning' (see Annex 1 of the SHBEC FRA in Appendix 14A in PEI Report Volume III) identifies there to be existing fluvial flood defences upstream of the Site, located approximately 270 m south-west along Oldfleet Drain, upstream of the railway line. According to the information provided by the Environment Agency, these fluvial flood defences comprise earth embankments. Their

condition is 'fair' and will reduce the risk of flooding up to a 1% AEP (1 in 100 chance) event. The Environment Agency regularly inspect the defences to ensure potential defects are identified.

14.4.40 The Environment Agency confirmed that the Oldfleet Drain channel capacity is sufficient to convey flows in excess of a 1% AEP (1 in 100 chance) event.

14.4.41 Based on the information provided by the Environment Agency, it has been determined through the FRA that the Site is at a 'very low' risk of fluvial flooding from Oldfleet Drain or Middle Drain. No detailed modelled flood outlines are available for the local land drains around the Site perimeter, consequently, for the purposes of this assessment, Oldfleet Drain is not considered to pose a risk of fluvial flooding to the Site.

Groundwater Sources

14.4.42 Groundwater flooding can occur when groundwater levels rise above ground surface levels. The underlying geology has a major influence on where this type of flooding takes place; it is most likely to occur in low-lying areas underlain by permeable rocks (aquifers).

14.4.43 The Environment Agency's 'Areas Susceptible to Groundwater Flooding' map is illustrated in Annex 2 of the Joint Lincolnshire Flood Risk and Drainage Management Strategy (LFRDMPF, 2012). The map is divided into 1 km² grid-squares in which a percentage is given for what proportion of the 1 km² is considered to be susceptible to groundwater emergence. This map illustrates that the Site lies within a 1 km grid square of which up to 25% of the area is considered to potentially be at risk of groundwater emergence.

14.4.44 In 2006, a ground investigation was undertaken as part of the design phase for a Site Protection and Monitoring Programme (SPMP) for the SHBPS. A review and summary of the ground investigation (RSK, 2011) states that the intrusive ground investigation inferred that groundwater flowed towards the south-east and recorded resting groundwater depths across a monitoring well network ranging from 0.22 m below casing top (bct) to 1.55 m bct.

14.4.45 The risk of groundwater flooding within the Proposed Development area within the Site through the FRA is therefore considered to be 'low' to 'medium'.

Artificial Sources – Reservoirs and Canals

14.4.46 The Environment Agency defines a reservoir as an artificial body of water which can hold >25,000 cubic meters or more of water, above ground level as specified in The Reservoirs Act (1975). The closest reservoir to the Site is located approximately 13 km south-east of the Site, north of Rothwell, west of Cuxwold. The Environment Agency 'Flood Risk from Reservoirs' map (Environment Agency, 2019) illustrates that there is very low flood risk to Site from reservoirs in the event of a breach scenario.

14.4.47 There are no artificial sources of flood risk, such as reservoirs or canals in close proximity to the Site. It is therefore considered that there these sources pose very low flood risk to the Site.

Surface Water Runoff to the Site - Overland Flow of Rainfall Runoff

14.4.48 The Environment Agency 'Flood Risk from Surface Water' map (Environment Agency, 2019) identifies the vast majority of the Site to be at a 'very low' risk from surface water flooding (<0.1% AEP event). Small areas along the roads and along adjacent land drains within the Site are identified to be at a 'low', 'medium' and 'high' risk from surface water flooding (>0.1% AEP, 3.3% to 1% AEP event and >3.3% AEP event respectively). The Main Development Area within the Site is illustrated as being predominantly at a 'very low' risk from surface water flooding, with very small areas at 'low risk' at the topographic low points.

14.4.49 Additionally, this information is supported by the fact that there are no significantly raised ground levels adjacent to the Site that could generate sufficient rates/ volumes of surface water runoff to pose a risk of overland flow coming into the Site.

14.4.50 The risk of surface water flooding within the Proposed Development area within the Site from elsewhere is therefore considered to be 'low' to 'very low'.

Existing Drainage Infrastructure

14.4.51 The existing surface water drainage infrastructure within the Site is illustrated in drawings in Annex 1 of the Outline Drainage Strategy (Appendix 14B in PEI Report Volume III). There is no formal drainage network for the Main Development Area.

14.4.52 The two man-made ponds within the Main Development Area shown on OS mapping (see Figure 14.1 in PEI Report Volume II) have recently been drawn down and infilled, and are therefore not considered further within this assessment.

14.4.53 Processed effluent (consisting of primarily of boiler water) from SHBPS discharges into effluent basins with buried outlet pipes connected to the cooling water pumping station at the far eastern extent of the Site. Surface water from the rooftop and access road areas of the Site is currently collected via gullies and conveyed into these effluent basins via buried surface water pipelines. A body of standing water located adjacent to the cooling water pumping station to the east of the Site is a holding channel for water in and out of the cooling pipes, as presented in Figure 14.1 in PEI Report Volume II. The combined water is discharged off Site into the Humber Estuary.

14.4.54 It is assumed that the land drains located around the perimeter of the Site (Land Drains 1 and 2 presented in Figure 14.1 in PEI Report Volume II) accept lateral drainage of surface water from the greenfield areas of the Site, including the Main Development Area. These eventually discharge to the Humber Estuary via Middle Drain Pumping Station (to the north of the Site).

14.4.55 The NPSs and NPPF require that the Proposed Development should not increase flood risk on the Site and the surrounding area. Therefore, surface water runoff rates leaving the Site should not exceed the existing runoff rate. The existing surface water greenfield runoff rates for the Main Development Area (i.e. the part of the Site where new impermeable areas will be created as part of the Proposed Development) were calculated using FEH Web Service catchment descriptors and Depth Duration Frequency (DDF) FEH2013 model data for the local catchment area. The detailed calculation parameters used for the runoff rates can be found in the Outline Drainage Strategy (Appendix 14B in PEI Report Volume III).

14.4.56 The cooling water chamber is considered to pose a 'very low' risk of surface water flooding to the Main Development Area within the Site. The risk to the Site from overland flow of surface water generated adjacent to the Site, or from waterbodies located within the Site is considered to be 'low' in small areas, but largely 'very low'.

14.4.57 The risk to the Site from overland flow of surface water generated adjacent to the Site, or from waterbodies located within the Site is considered to be 'low' in small areas, but largely 'very low'.

Summary of Baseline Character of the Receptors

14.4.58 Only watercourses in close proximity (hydraulic connectivity) to the Site and with the significant potential to be affected by the Proposed Development have been considered further within this impact assessment. The baseline description has been used to characterise each reach of the water resources within the vicinity of the Site, with the assessment summarised in Table 14.6. This was undertaken following the characterisation methodology specified in Table 14.1.

Table 14.6: Importance of identified surface water feature/ receptor

RECEPTOR / WATERCOURSE	SENSITIVITY	VALUE	RECEPTOR IMPORTANCE
Humber Estuary	High vulnerability to temporary or permanent changes in water resources (including water quality), as well as discharges/ pollution incidents, flood risk and drainage	High	High
Oldfleet Drain	Low vulnerability to temporary or permanent changes in water resources (including water quality), as well as abstractions/ discharges/ pollution incidents, flood risk and drainage	High (pre-cautionary approach given moderate WFD waterbody status)	Medium
Middle Drain	Low vulnerability to temporary or permanent changes in water resources (including water quality), as well as abstractions/ discharges/ pollution incidents, flood risk and drainage	Medium	Low
Local Land Drain 1	High vulnerability to temporary or permanent changes in water resources (including water quality), as well as abstractions/ discharges/ pollution incidents, flood risk and drainage	Negligible	Low (precautionary approach given proximity to site)
Local Land Drain 2	High vulnerability to temporary or permanent changes in water resources (including water quality), as well as abstractions/ discharges/ pollution incidents, flood risk and drainage	Negligible	Low (precautionary approach given high value/ importance)

RECEPTOR / WATERCOURSE	SENSITIVITY	VALUE	RECEPTOR IMPORTANCE
Local Land Drain 3	Medium vulnerability to temporary or permanent changes in water resources (including water quality), as well as abstractions/ discharges/ pollution incidents, flood risk and drainage	Low	Low
Local Land Drain 4	Low vulnerability to temporary or permanent changes in water resources (including water quality), as well as abstractions/ discharges/ pollution incidents, flood risk and drainage	Negligible	Low
Local Land Drain 5	Low vulnerability to temporary or permanent changes in water resources (including water quality), as well as abstractions/ discharges/ pollution incidents, flood risk and drainage	Negligible	Low
Local Land Drain 6	Negligible	Negligible	Negligible

14.4.59 The Humber Estuary has a high sensitivity based on vulnerability given its distance from and connectivity to the Proposed Development, and high value and importance based on its international designations and moderate WFD classification. The likely character of this watercourse has been assessed as 'High' to allow further consideration of effects.

14.4.60 Oldfleet Drain has a low sensitivity, based on the vulnerability given its distance from the Proposed Development but a High value and medium importance based on its WFD status classification (Moderate). The likely character of this watercourse has been assessed as 'Medium' to allow further consideration of effects.

14.4.61 Middle Drain has a low sensitivity, based on the vulnerability, given its distance from the Proposed Development but a medium value and low importance due to receiving water from land drains 4 and 5 directly from the Proposed Development. The likely character of this watercourse has been assessed as 'Low' to allow further consideration of effects.

14.4.62 Land Drain 1 and Land Drain 2 have a high sensitivity (based on vulnerability) due to their proximity to the Site but both are of negligible value and low importance. As a precautionary approach, the likely character of these watercourses has been assessed as 'Low' to allow further consideration of effects.

14.4.63 Land Drain 3 has a medium sensitivity (based on vulnerability) as it is the main receiving watercourse receiving waters indirectly from the Site. However, it is further in proximity from the Proposed Development and has low value and low importance;

therefore, the likely character of Land Drain 3 has been assessed as low. The likely character of this watercourse has been assessed as 'Low' to allow further consideration of effects.

14.4.64 Land Drain 4 and Land Drain 5 have a low sensitivity and are of negligible value and low importance - the likely characters of these watercourses are assessed as 'Low' to allow further consideration of effects.

14.4.65 Land Drain 6 has been assessed as negligible sensitivity, on account of no known flow pathways from Site to watercourse, and the reaches are of negligible value or importance. The likely character of this watercourse has been assessed as 'Negligible' and has therefore been scoped out of further assessment.

14.5 Development Design and Impact Avoidance

14.5.1 As stated in Section 14.3 above this assessment of likely effects of the Proposed Development on water resources, flood risk and drainage follows the methodology outlined by IEMA (2011). As such, this assessment assesses the completely unmitigated development scenario first, and then later states the reductions in the impacts and effects following the application of any necessary mitigation.

14.5.2 The mitigation required following the assessment is outlined in Section 14.7 and includes what is often referred to as embedded mitigation i.e. mitigation already assumed in the form of best practice measures or measures built into the design of the Proposed Development.

14.6 Likely Impacts and Effects

14.6.1 This section presents the impact assessment for the receptors with low, medium or high character identified in the previous section. Those with negligible character have not been considered further. The Proposed Development has the potential to affect water resources (primarily via WFD through water quality), flood risk (surface water only) and drainage. This includes both local water quality and suspended sediment quality from construction activities, and potential long-term benefits of improved flood risk resilience and drainage through water attenuation on Site. The Proposed Development has the potential to change local dilution patterns through changes in surface water flow pathways and temporary changes to the quantity of flow in the watercourses.

14.6.2 Construction, operational and maintenance activities at the Proposed Development are considered to potentially alter the water resources (water quality), flood risk and drainage of local watercourses with direct surface water interactions from Site runoff. These are primarily associated with Land Drain 1, Land Drain 2 and Land Drain 3. There is also the potential for these effects to continue to adjacent receiving watercourses, primarily Oldfleet Drain and Middle Drain as well as Land Drain 4 and Land Drain 5 (downstream in receiving watercourses for Land Drain 1).

14.6.3 Potential impacts from construction activities have been identified as follows:

- **Potential Impact A** - potential change to the surrounding ditches (culverting/ extension to culverts/ installation of fencing);
- **Potential Impact B** - potential loss of tidal floodplain storage and temporary changes to fluvial flood water flow routing within Flood Zone 3 during construction (although the Site benefits from flood defences);
- **Potential Impact C** - pollution of surface watercourses within or near the Proposed Development Site during construction due to spillages or polluted surface water runoff entering the watercourse (if an appropriate Construction Environmental Management Plan (CEMP) is not adhered to);

- **Potential Impact D** - change to the impermeable area within the Site, and associated changes to surface water flows during construction;

14.6.4 Potential impacts from operational and maintenance activities have been identified as follows:

- **Potential Impact E** - change to the impermeable area within the Site, and associated changes to surface water flows during operation and maintenance of the Proposed Development;
- **Potential Impact F** - potential loss of tidal floodplain storage as the footprint of the Proposed Development is located in Flood Zone 3 (although the Site benefits from flood defences);
- **Potential Impact G** - pollution of surface watercourses within or near the Site during operation and maintenance, due to spillages or polluted surface water runoff entering the watercourse (if materials are not appropriately stored at the Site in accordance with an appropriate operational Environmental Management System and/ or an appropriate drainage system is not implemented and maintained).

14.6.5 These potential impacts are assessed below against the applicable sensitive receptors.

Construction

Potential Impact A - Potential change to the surrounding ditches (culverting/ extension to culverts/ installation of fencing)

14.6.6 The only fluvial water receptor potentially affected directly as a result of construction activity is Land Drain 1 considered to be of 'Low' importance (see Table 14.6). The proposed access from South Marsh Road will cross Land Drain 1 using a new culvert or extension of the existing culvert in the north-eastern corner of the Main Development Area. There is subsequently the potential for impacts on this watercourse as a result of constructing a culvert. This activity could reduce its conveyance capacity and discharge ability if the bridge is not free-span in design and if installation equipment/ machinery is positioned within the channel. Water could then potentially back-up to the west along the drain, increasing the risk of localised fluvial flooding.

14.6.7 The magnitude of impacts of this construction activity will be high given it is located immediately within the watercourse corridor, but is likely to impact only a short, very localised reach of the watercourse. The impact of construction will be low probability given the likely rarity of any fluvial flood event occurring from this watercourse. The nature of the effect of the construction activity has therefore been assessed as 'Medium'; with low probability long term but reversible adverse effects on the flood risk and the drainage.

14.6.8 Given that the likely character of Land Drain 1 is considered to be a 'Low' importance receptor and the nature of the effects is 'Medium', the likely significance of the effect from this construction activity is 'Minor' adverse.

Potential Impact B - Potential loss of tidal floodplain storage and temporary changes to fluvial flood water flow routing as the footprint of the Proposed Development is located within tidal Flood Zone 3 during construction of the Proposed Development (although the Site benefits from flood defences)

14.6.9 The Environment Agency's modelling has illustrated that there is a very low/ negligible risk of fluvial flooding to the Site from Land Drains 1 to 5, Middle Drain or Oldfleet Drain, considered to be of 'Low', 'Low' and 'Medium' importance respectively (see Table 14.6). The residual high risk of tidal flooding (Flood Zone 3) would only be incurred if the Humber Estuary defences were overtopped during a low probability/ rare event or experienced an unlikely breach failure.

- 14.6.10 No land raising is proposed at the Site. Stockpiles of construction materials will temporarily be present along with other temporary requirements during construction e.g. welfare facilities within the Site. Therefore, if a defence breach/ overtopping event were to occur while material was stored, a reduction in the floodplain storage availability and localised flood water routing mechanisms could result in an adverse impact, as it could lead to partial displacement of the available tidal floodplain volume and divert floodwater around them. A small volume of floodplain might also be lost, attributed to that displaced by the new building walls and access ramps to the fuel reception hall. Construction activities could therefore increase the localised flood risk to the neighbouring watercourses (Oldfleet Drain, Middle Drain, and Land Drains 1-5). However, these would already become fully submerged by the tide during such an event.
- 14.6.11 The magnitude of this adverse impact for all these watercourses is assessed as medium given the number of watercourses potentially impacted and their close proximity to the Site. However, since the overall nature of the effect of the construction activity is localised, it has been assessed as 'Low'. This is due to the low probability of an overtopping or breach failure event occurring, especially while materials were stockpiled. The impacts on flood risk would be short term and are reversible, as when the construction phase is completed, the stockpiles of materials will have been utilised.
- 14.6.12 Oldfleet Drain could be potentially impacted by temporary changes to the routing of floodwater and floodplain storage availability within Flood Zone 3 during construction. Given that the likely character of Oldfleet Drain is considered to be a 'Medium' importance receptor and the nature of the effect is 'Low', the likely significance of the effect from this construction activity is assessed to be 'Minor' adverse.
- 14.6.13 Middle Drain and Land Drains 1 to 5 could also be potentially impacted by temporary changes to the routing of floodwater and floodplain storage availability within Flood Zone 3 during construction. Given that these watercourses are considered to be 'Low' importance receptors and the nature of the effect is 'Low', the significance of the effect from this construction activity is assessed to be 'Negligible'.

Potential Impact C - Pollution of surface watercourses within or near the Proposed Development Site during construction due to spillages or polluted surface water runoff entering the watercourse

- 14.6.14 The predicted impacts of the Proposed Development construction works could lead to elevated risks of leakage or accidental spillage of construction materials and potential pollutants used on Site. These could migrate to nearby surface watercourses. Washout facilities (washing of tools, plant and equipment), storage and use of various liquids and soluble solids, unstable exposed soils, excavated materials, stored aggregates, contaminated road surfaces, and fuel storage and the handling of these could have the potential to result in pollution of water resources. Inappropriate disposal of waste materials associated with the construction phase of the Proposed Development could also have the potential to enter surface water. Contaminants could include highly alkaline sediments from concreting works, organic material, nutrients and pollutants; in turn, this could influence water quality.
- 14.6.15 Land Drains 1 and 2, considered to be of 'Low' importance (see Table 14.6), could be impacted by short term runoff associated with local stockpiling, construction works and drainage improvement works that could convey sediment and contaminants. Dilution capacity in the drains is expected to be low and therefore the runoff could have a potential impact. The magnitude of the impact is however low and the nature of the effects of the construction activity is assessed as 'Medium'; with medium probability, reversible and medium term adverse effects on the water quality. Given the likely character of Land Drain 1 and Drain 2 is 'Low' and the nature of the effect is 'Medium',

the likely significance of the effects from this construction activity is assessed to be 'Minor' adverse.

- 14.6.16 Land Drain 4 and Land Drain 5 receive water from Land Drain 1; and Land Drain 3 receives water from Land Drain 2 (all considered to be of 'Low' importance (see Table 14.6)). The nature of the effects of the construction activity is assessed as 'Low'; with low probability, reversible and short term adverse effects on the water quality. Given the likely character of Land Drain 3, Land Drain 4 and Land Drain 5 are 'Low' and the nature of the effect is 'Low', the likely significance of the effects from this construction activity is 'Negligible'.
- 14.6.17 Middle Drain, considered to be of 'Low' importance (see Table 14.6) receives water from Land Drain 4 and Land Drain 5 and therefore, the nature of the effects of the construction activity is assessed as 'Negligible'; with negligible probability, reversible and short term adverse effects on water quality. Given the likely character of Middle Drain is 'Low' and the nature of the effect is 'Negligible', the likely significance of the effects from this construction activity is 'Negligible'.
- 14.6.18 Humber Estuary (considered 'High' importance (see Table 14.6)) receives water indirectly via the land drains and then then Middle Drain and Middle Drain pumping station and Oldfleet Drain and its tidal flapped outfall. Therefore, the nature of the effect of the construction activity on the Humber Estuary is assessed as 'Negligible': with low probability, reversible and short term adverse effects on the water quality. Given the likely character of the Humber Estuary is 'High' and the nature of the effects is 'Negligible', the likely significance of the effects from this construction activity is 'Negligible'.
- 14.6.19 Oldfleet Drain (considered to be of 'Medium' importance (see Table 14.6)) receives water indirectly from Land Drain 2 therefore the nature of the effect of the construction activity is assessed as 'Low': with low probability, reversible and short term adverse effects on the water quality. Given the likely character of Oldfleet Drain is 'Medium' and the nature of the effects is 'Low', the likely significance of the effects from this construction activity is 'Minor' adverse.

Potential Impact D - Change to the impermeable area within the Proposed Development Site, and associated changes to surface water flows during construction of the Proposed Development

- 14.6.20 Land Drain 1 and Land Drain 2, considered to be of 'Low' importance (see Table 14.6), are currently understood to receive lateral inflows of surface water runoff from the greenfield area of the Main Development Area. During construction of the Proposed Development, the impermeable land use area is expected to increase by up to 6.5 ha (to be confirmed at the detailed design stage), which could result in a significant increase in the rates and volumes of surface water runoff, thus is an increase in flood risk to the Site and neighbouring land-uses if no mitigation was to be implemented.
- 14.6.21 The magnitude of this impact is therefore assessed as 'High' - given the extensive area of permeable greenfield land-use that will be lost and that the impacts within the Site boundary are located within immediate proximity to the Land Drains. The nature of the effect of the construction activity is assessed as 'High': with high probability, short term effects on flood risk and drainage that are non-reversible in the short term.
- 14.6.22 Given the likely character of these watercourses is 'Low' and the nature of the effect is 'High', the likely significance of effect from this construction activity is 'Moderate' adverse in the absence of any mitigation.

Maintenance and Operation***Potential Impact E - Change to the impermeable area within the Site, and associated changes to surface water flows during operation and maintenance.***

- 14.6.23 As with Potential Impact D, during operation and maintenance of the Proposed Development the impermeable area within the Main Development Area is expected to have increased by up to 6.5 ha (to be confirmed at the detailed design stage) generating increased rates and volumes of surface water runoff. Failure, blockage and capacity exceedance are also a potential risk to the Site and the surrounding area. These impacts would again be limited to Land Drain 1 and Land Drain 2 with the same likely significance of effect; 'High'.
- 14.6.24 Land Drain 1 and Land Drain 2 could therefore be potentially impacted by changes to the impermeable area within the Site during operation and maintenance of the Proposed Development. Given the likely character of these watercourses is 'Low' and the nature of the effect is 'High', the likely significance of effect from this operation activity is 'Moderate' adverse in the absence of any mitigation.

Potential Impact F - Potential loss of tidal floodplain storage as the footprint of the Proposed Development is located in Flood Zone 3 (although the Site benefits from flood defences)

- 14.6.25 The predicted impacts of the Proposed Development in operation could lead to potential loss of floodplain storage as the footprint of the Proposed Development is located in Flood Zone 3. The Environment Agency's modelling has illustrated that there is a very low/ negligible risk of fluvial flooding to the Site from the Land Drains, Middle Drain or Oldfleet Drain, considered to be of 'Low', 'Low' and 'Medium' importance respectively (see Table 14.6). The residual high risk of tidal flooding (Flood Zone 3) would only occur in the low probability event that the Humber Estuary defences were overtopped or experienced a breach failure.
- 14.6.26 No land raising is proposed at the Site and therefore, the volume displaced is likely to be limited to that of the walls of the new buildings and access ramps into the fuel reception hall within the Site. These are expected to only displace a negligible amount of floodwater, however a potential impact on the local watercourses (Oldfleet Drain, Middle Drain, Land Drain 1, Land Drain 2, Land Drain 3, Land Drain 4 and Land Drain 5) could be incurred. As a result of which, the tidal floodwater volume capacity is likely to be reduced if a defence breach/ overtopping event were to occur.
- 14.6.27 No significant increase in the localised flood risk to the watercourses in the Study Area would likely be incurred, as these would be already be fully submerged by the tide. The magnitude of this impact on all watercourses in the Study Area is medium but as the nature of the effect of the operation activity is localised, it is assessed as 'Low': with low probability, long term adverse but reversible effects on the flood risk.
- 14.6.28 Oldfleet Drain could be potentially impacted by a potential loss of floodplain storage as the footprint of the Proposed Development is located in Flood Zone 3. Given that the likely character of Oldfleet Drain is 'Medium' and the nature of the effect is 'Low', the likely significance of the effect from this operation activity is 'Minor' adverse.
- 14.6.29 Middle Drain and Land Drains 1 to 5 could be potentially impacted by a potential loss of floodplain storage as the footprint of the Proposed Development is located in Flood Zone 3. Given the likely character of these watercourses is 'Low' and the nature of the effect is 'Low', the likely significance of the effect from this operation activity is 'Negligible'.

Potential Impact G - Pollution of surface watercourses within or near the Site during operation and maintenance of the Proposed Development, due to potential spillages or polluted surface water runoff entering the watercourse

- 14.6.30 The Proposed Development could lead to pollution of surface watercourses within or near the Site during operation and maintenance of the Proposed Development, due to spillages or polluted surface water runoff entering the watercourses within or near the Site. However, there will be minimal contaminated wastewater generated from the Proposed Development during operation and maintenance and any wastewater that is generated will predominantly be reused within the process. Any uncontaminated surface water will be kept segregated and discharged directly to the land drainage system immediately adjacent to the southern or northern Site boundary. Whilst pollution prevention features such as SuDS would be included in the design, there could still be potential for leakage from the system to occur (albeit the risk is very low).
- 14.6.31 The impacts associated with contamination of surface water (with sediments, fuels etc.) arising from the operation and maintenance of the Proposed Development are considered to be the same as those assessed in relation to leakage from the drainage system. Implementation of the mitigation measures would mean that the risk of contamination of site runoff is low. The mitigation set out in the Outline Drainage Strategy for the Proposed Development (Appendix 14B in PEI Report Volume III) will be developed further through the detailed design phase.
- 14.6.32 Land Drain 1 and Land Drain 2 could be impacted by short-term contaminated runoff during operation and maintenance of the Proposed Development. The magnitude of the impact however is expected to be low and the nature of the impact during operation and maintenance of the Proposed Development is assessed as 'Medium'; with medium probability, reversible and medium term adverse effects on the water quality. Given the likely character of Land Drain 1 and Land Drain 2 is 'Low' and the nature of the effect is 'Medium', the likely significance of the effect from this operation and maintenance activity is 'Minor' adverse.
- 14.6.33 Land Drain 4 and Land Drain 5 receive water from Land Drain 1; and Land Drain 3 from Land Drain 2. Given that the magnitude of the impacts on Land Drain 1 and 2 are assessed as low, the nature of the effect during operation and maintenance of the Proposed Development on Land Drains 3, 4 and 5 is also assessed as 'Low'; with low probability, reversible and long term adverse effects on the water quality. Given the likely characters of Land Drain 3, Land Drain 4 and Land Drain 5 are 'Low' and the nature of the effect is 'Low', the likely significance of the effect from this operation activity is 'Negligible'.
- 14.6.34 Middle Drain receives water from Land Drain 4 and Land Drain 5. Given that Land Drain 4 and Land Drain 5 receive water from Land Drain 1 and Land Drain 2, and the magnitude of the impacts on Land Drain 1 and 2 are assessed as low, the nature of the effect in operation on Middle Drain is assessed as 'Negligible'. Given the likely character of Middle Drain is 'Low' and the nature of the effect is 'Negligible', the likely significance of the effect from this operation and maintenance activity is 'Negligible'.
- 14.6.35 Oldfleet Drain receives water indirectly from Land Drain 2. Given that the magnitude of the impacts on Land Drain 1 and 2 are assessed as low, the nature of the effect in operation and maintenance of the Proposed Development on Oldfleet Drain is assessed as 'Low'; with low probability, reversible and long term adverse effects on the water quality. Given the likely character of Oldfleet Drain is 'Medium' and the nature of the effect is 'Low', the likely significance of the effect from this operation activity is 'Minor' adverse.
- 14.6.36 Humber Estuary (considered 'High' importance (see Table 14.6)) receives water indirectly via the land drains and then Middle Drain and Middle Drain pumping station

and Oldfleet Drain and its tidal flapped outfall. Therefore, the nature of the effect in operation and maintenance of the Proposed Development on the Humber Estuary is assessed as 'negligible'; with low probability, reversible and long term adverse effects on the water quality. Given the likely character of the Humber Estuary is 'High' and the nature of the effects is 'Negligible', the likely significance of the effects from this activity is 'Negligible'.

Decommissioning

14.6.37 Decommissioning of the Proposed Development will see the removal of all above ground structures down to ground level such that the Main Development Area is cleared with only areas of hardstanding remaining.

14.6.38 It is assumed that all underground infrastructure will remain in-situ; however, all connection and access points will be sealed or grouted to ensure disconnection. On this basis, decommissioning impacts are expected to be limited to on Site waterbodies in close proximity to the Proposed Development and will be the same as construction impacts, as discussed above.

Comparison of Proposed Development and Consented Development

14.6.39 The impacts and effects of the Proposed Development compared to a future baseline with the Consented Development are described below.

Construction

14.6.40 As described within this Chapter and as concluded by the FRA (Appendix 14A in PEI Report Volume III) and presented in the Outline Drainage Strategy for the Proposed Development (Appendix 14B in PEI Report Volume III), the impacts on surface water, flood risk and drainage from the Proposed Development are the same as those predicted for the construction of the Consented Development.

14.6.41 This is because the assessment for the Consented Development used the Rochdale Envelope approach in assuming a worst case for the footprint and impermeable areas. These areas have not changed for the Proposed Development and the nature and overall scale of construction activity is also unchanged.

14.6.42 In addition the same methods for managing construction impacts (as set out in Section 14.7 below) will be applied for both Consented Development and the Proposed Development.

14.6.43 As such, the construction of the Proposed Development is predicted to have no additional effects compared to a future baseline with the construction of the Consented Development.

Operation

14.6.44 The change to impermeable area during operation of the Proposed Development, which could increase surface flows of water and potentially impact on flood risk is the same as that for the Consented Development and (as for the Consented Development) will be managed by an appropriate drainage system (refer to Appendix 14B in PEI Report Volume III).

14.6.45 Similar to the construction phase for the Consented Development, appropriate measures will be put in place for the operational Proposed Development to prevent spillages, and therefore there is a low probability of pollution events (to surface or groundwater) occurring.

14.6.46 As no land raising is proposed for either the Consented Development or the Proposed Development, there would be no change to the volumes of water displaced by the Proposed Development compared to the Consented Development

14.6.47 The same flood resilience measures and emergency protocols would be applied for either the Consented Development or the Proposed Development. However, due to additional flood level information received from the Environment Agency since the Consented Development assessment, the place of safe refuge and critical equipment of the Proposed Development will be accommodated at a slightly higher elevation of >4.60 mAOD instead of >4.55 mAOD as was estimated for the Consented Development at the time of the planning application.

14.6.48 On this basis, the operation of the Proposed Development is predicted to have no additional effects compared to a future baseline with the operation of the Consented Development.

Decommissioning

14.6.49 The nature and scale of decommissioning activities would be the same for the Proposed Development as for the Consented Development, so the decommissioning of the Proposed Development is predicted to have no additional effect compared to a future baseline with the decommissioning of the Consented Development.

14.7 Mitigation and Enhancement Measures

14.7.1 As described in Section 14.3 the assessment presented in Section 14.6 made no allowance for legislative requirements or best practice mitigation and control measures. A number of such measures will be followed during the construction, operation and maintenance of the Proposed Development as detailed in this section.

Construction

14.7.2 The measures set out below will be required of any contractors undertaking construction work in relation to the Proposed Development.

14.7.3 As a general measure to protect surface water from a range of potentially dangerous activities associated with construction of this type, best practice will be implemented through a CEMP and contractors undertaking works within the Site will comply with relevant guidance during construction, including, but not limited to, the Environment Agency Guidance for Pollution Prevention and associated Pollution Prevention Guidance Notes. The CEMP will cover: guidance for the contractor(s) ensuring that Proposed Development construction personnel are fully aware of the potential impact to water resources associated with the proposed construction works and procedures to be followed in the event of an accidental pollution event occurring. This will be included in the Site induction and training, with an emphasis on procedures and guidance to reduce the risk of water pollution.

14.7.4 A Framework CEMP is provided in Appendix 5A in PEI Report Volume III.

Water Resources

14.7.5 Pollution Plans to deal with accidental pollution will be drawn up and agreed with the Environment Agency and NEL IDB, prior to construction of the Proposed Development commencing and any necessary equipment (e.g. spillage kits) shall be held on the Site and relevant Site personnel will be trained in their use. The Environment Agency and NELC will be informed immediately in the unlikely event of a suspected pollution incident.

14.7.6 Measures set out in the Environment Agency, Defra and HMG guidance listed in Section 14.2.46 will be followed in the storage of materials within the Main Development Area of the Site. Examples of such measures include:

- placing arisings and temporary stockpiles away from drainage systems, and directing surface water away from stockpiles to prevent erosion;

- implementing containment measures including drip trays, bunding or double-skinned tanks of fuels and oils, storing all chemicals in accordance with their Control of Substances Hazardous to Health (COSHH) guidelines and providing spill kits in areas of fuel/ oil storage;
- keeping plant and machinery away from surface water bodies wherever possible and installing drip trays beneath oil tanks/ engines/ gearboxes and hydraulics, which are checked and emptied regularly;
- locating refuelling and delivery areas away from surface water drains; and
- protecting exposed ground and stockpiles as appropriate and practicable to prevent windblown migration of potential contaminants, and using water suppression if there is a risk of fugitive dust emissions.

Flood Risk

- 14.7.7 Construction works undertaken adjacent to, beneath and within watercourses will comply with relevant guidance during construction, including the Environment Agency, Defra and HMG guidance (see paragraph 14.2.46) and the requirements of NELC.
- 14.7.8 The CEMP will incorporate measures aimed at preventing an increase in flood risk during the construction works associated with the Proposed Development. Examples of measures that will be implemented in the Main Development Area within Flood Zone 3 include:
- storing topsoil and other construction materials is not possible outside of tidal Flood Zone 3; and
 - maintaining connectivity between the floodplain and the River Humber, with no increases in ground level within the floodplain as far as practicable.
- 14.7.9 The construction contractor will be required to produce a Flood Emergency Response Plan which will provide details of the response to an impending flood and include:
- a 24 hour availability and ability to mobilise staff in the event of a flood warning;
 - the removal of all plant, machinery and material capable of being mobilised in a flood for the duration of any holiday close down period;
 - details of the evacuation and site closedown procedures; and
 - arrangements for removing any potentially hazardous material and anything capable of becoming entrained in floodwaters, from the temporary works areas.
- 14.7.10 The Flood Emergency Response Plan would utilise the Environment Agency Flood Warning Service (Environment Agency, 2019). The construction supervisor will be notified of any potential flood occurring by use of the Floodline Warnings Direct service. Further details are included within the FRA presented in Appendix 14A in PEI Report Volume III.

Drainage

- 14.7.11 It is proposed in the Outline Drainage Strategy (presented in Appendix 14B in PEI Report Volume III) that surface water is to be collected within the Site and conveyed to a surface water attenuation pond SuDS feature via the use of gullies, drainage ditches/ swales, where possible. Site topography is conducive for flows to be gravity drained to a new surface water attenuation pond located at the eastern edge of the Main Development Area. It is proposed that this attenuation pond will outfall into one of the existing land drainage ditches located along the northern or southern boundaries of the Site (either Land Drain 1 or Land Drain 2 respectively) using a flow control mechanism such as a Hydro-Brake to limit the discharge to the existing greenfield rates.

14.7.12 Plans for any discharge and/ or disposal of potentially contaminated water will be agreed in advance with the Environment Agency, Anglian Water, the NEL IDB and NELC where appropriate (and permits obtained as required). Such plans would include the following:

- all foul water from any site compound (including temporary toilets) would either be tankered away to an appropriate disposal facility by a licensed waste disposal contractor or treated on Site in a septic tank. Any potentially contaminated water will be tested, and if it is not of a suitable quality, agreed disposal procedures will be followed. Construction drainage details will be developed in consultation with the Environment Agency;
- any waters removed from excavations by de-watering will be discharged appropriately, subject to the relevant licenses being obtained; and
- foundations and services will be designed and constructed to prevent the creation of pathways for the migration of contaminants and will be constructed of materials that are suitable for the ground conditions and designed use. No discharges from any self-contained wheel wash and localised wheel wash would be permitted to discharge into any surface water system.

14.7.13 Facilities will be provided during the construction phase of the Proposed Development, where necessary, to ensure controlled discharge of any surface water runoff that might occur. It would be a contractual requirement of the contractor to ensure that any runoff from the Site does not cause pollution or flooding.

14.7.14 Measures to be considered on the finalisation of detailed design include implementation of temporary drainage through the construction design and/ or CEMP include:

- installation of measures such as silt fences and appropriately sized settlement tanks/ ponds to reduce sediment load;
- cut-off ditches or geotextile silt-fences, installed around excavations, exposed ground and stockpiles to prevent uncontrolled release of sediments from the Proposed Development;
- regular cleaning of Site access points to prevent build-up of dust and mud;
- installation of valves to isolate the settlement tank/ ponds in the event of a polluted discharge;
- installation of oil interceptors (notably the outflow from the settlement pond/ tank) to reduce the potential risk for contamination of groundwater and surface water; and
- separate drainage for all potentially polluted waters (including washdown areas, stockpiles and other areas of risk for water pollution) which are to be tankered away from the Site.

14.7.15 In addition, if monitoring demonstrates unsatisfactory levels of solids or other pollutants, measures would be implemented (e.g. changes to site drainage and settlement facilities and/or use of flocculants) to control suspended solids or other polluted discharge to watercourses.

14.7.16 A septic tank is likely to be used for treatment of sanitary or domestic wastewater from offices/ administration/ welfare facilities during the construction period. This septic tank will be emptied as required and tankered off Site to a waste water treatment plant.

Operation and Maintenance

14.7.17 Throughout its lifetime, the Proposed Development will be regulated by the Environment Agency through an Environmental Permit, which will include conditions relating to handling, storage and use of diesel and other chemicals, including emergency

procedures in line with the use of Best Available Techniques (BAT). These measures will be in place to prevent pollution during plant operation and maintenance in accordance with the Permit.

Water Resources

14.7.18 A number of the impact avoidance measures employed during the construction phase of the Proposed Development will remain for the operational and maintenance phases (where relevant), and will be implemented through the Site operator's Environmental Management System (EMS). For example:

- plans to deal with accidental pollution and any necessary equipment (e.g. spillage kits) will be held on Site and all Site personnel will be trained in their use, for example the plan will incorporate details on how to appropriately deal with accidental spillages to ensure they are not drained to any surface water system;
- containment measures will be implemented, including bunding or double-skinned tanks for fuels and oils, and all chemicals will be stored in accordance with their COSHH guidelines; and
- oil interceptors will be incorporated into the drainage system to prevent material entering the surface water drainage system or local waterbodies.

Flood Risk

14.7.19 The operator of the Proposed Development will be required to subscribe to the Environment Agency's Flood Warning and Alert Service in the area.

14.7.20 As a precaution, flood resilience measures will be incorporated into the Proposed Development design to minimise the amount of damage and reduce the recovery time in the unlikely case of the Site becoming inundated. During the detailed design and construction of the Proposed Development the opportunity will be taken to adopt flood resilient design techniques.

14.7.21 The following resilience measures have been identified as possible options for inclusion at the Site, subject to final design:

- critical equipment and a place of safe refuge for people (as outlined in the FRA in Appendix 14A in PEI Report Volume III) will be raised/ provided on an upper level of the building respectively above the 0.1% AEP event plus an allowance for climate change scenario flood water level of 4.60 mAOD (as defined by the Environment Agency's North Area Tidal Modelling study²) for the year 2115 as per Environment Agency guidance on climate change allowances;
- boundary walls and fencing could be designed with high water resistance materials and/ or effective seals to minimise water penetration for low depth, short duration floods; and
- tanks could be bunded to a level higher than the 0.5% AEP plus climate change event breach flood level.

² Acknowledged within Paras. 4.15 to 4.18 and Table 10 in the Flood Risk Assessment (Appendix 14A in PEI Report Volume III)

14.7.22 The following measures may also be considered for inclusion in the Proposed Development:

- pipelines and storage tanks designed to withstand the water pressures associated with high return period event flooding;
- tanks securely tethered in such a way as to ensure the infrastructure remains secure should flooding occur;
- electrical supply entering the Proposed Development from height and down to required connections;
- use of flood barriers on access points;
- protecting wiring for operational control of the Proposed Development, telephone, internet and other services by suitable insulation in the distribution ducts to prevent damage;
- materials with low permeability up to 0.3 m and acceptance of water passage through building at higher water depths;
- flood proofing including the use of flood resistant building materials, use of water resistant coatings, use of galvanised and stainless steel fixings and raising electrical sockets and switches;
- utilising floor materials that are able to withstand exposure to floodwater without significant deterioration and that can be easily cleaned, e.g. concrete-based or stone;
- incorporating water resistant services within the buildings, i.e. avoid services using ferrous materials;
- design of the Proposed Development to drain water away after flooding;
- providing access to all spaces to permit drying and cleaning;
- carefully considering the type of usage and layout of ground floor areas to minimise the potential impact on business operations following a flood; and
- suitable waterproofing measures to development located below ground i.e. tanking below ground storage areas etc.

Drainage

14.7.23 An Outline Drainage Strategy outlining how surface water would be managed post-development has been produced and is presented in Appendix 14B in PEI Report Volume III.

14.7.24 The Floods and Water Management Act 2010 places responsibility on local planning authorities, supported by the Environment Agency, to ensure new developments are unlikely to increase overall risk of flooding and requires SuDS criteria to be incorporated into the design. Post-development runoff volumes and rates should therefore be approximate to greenfield runoff rates.

14.7.25 In order to ensure that flood risk is not increased, in accordance with NPS EN-1 and NPPF, Environment Agency, NELC and NEL IDB requirements, surface water discharge of surface water runoff from the Main Development Area will be restricted to the existing greenfield runoff rate to prevent an increased risk of flooding downstream. The Proposed Development includes an attenuation pond as a surface water attenuation solution, to ensure water runoff rates assessed and presented within the FRA (Appendix 14A in PEI Report Volume III) are not exceeded.

- 14.7.26 SuDS standards require that the first choice of surface water disposal should be to discharge to infiltration systems. SuDS systems/ units shall also contribute to improving the water quality and sediment control. Attenuation will be achieved by limiting discharge through an appropriate flow attenuation device.
- 14.7.27 In line with the NPS EN-1 and the NPPF, Defra, Environment Agency, NELC and NEL IDB advisory recommendations, best practice guidelines and local planning policy, SuDS techniques detailed in the CIRIA SuDS Manual (CIRIA, 2007) will be used as a preferential option. A summary of potential SuDS techniques which could be used at the Site are found in Table 5 of the Outline Drainage Strategy (presented in Appendix 14B in PEI Report Volume III). This is not an exhaustive list of techniques and so other options could be explored at the detailed drainage design stage for the Proposed Development.
- 14.7.28 Surface water will be collected on Site from the Main Development Area and conveyed into a surface water attenuation pond SuDS feature at the eastern extent of the Main Development Area via the use of drainage gullies, ditches/ swales (where possible). It is proposed that this attenuation pond will outfall into one of the existing Land Drains as shown on Figure 14.1 in PEI Report Volume II located along the southern or northern boundaries of the Site using a flow control mechanism such as a Hydro-Brake to limit the discharge to greenfield rates. The detailed drainage design phase will need to confirm that the bed levels of the local land drains into which the attenuation solution will discharge are appropriate relative to the bed levels of the storage solution to ensure they are positively drained by gravity (i.e. to confirm that no additional pumping is required).
- 14.7.29 As the Middle Drain pumping station discharges into the tidal Humber Estuary, it may be the case that during some high-tide events, discharges into the southern drain become restricted. Design for this will be allowed for during the outline and detailed design phases of the Proposed Development. To illustrate the effect that this may have on the storage volume, a conservative assumption that no discharge is allowed into the drain during the duration of the critical storm has been applied.
- 14.7.30 In order to reduce the additional risk of failure, blockage and capacity exceedance above that of the design events for the drainage infrastructure, maintenance of the system will be incorporated in general site management and remains the responsibility of the Applicant. A manual will be prepared detailing each drainage feature on Site, the maintenance required, timescales for maintenance and who is responsible for undertaking the maintenance. It is expected the Site owners will ultimately be responsible for maintenance of the Site drainage system including all pipes, discharge structures and any SuDS implemented on Site in accordance with the recommendations in the SuDS Manual.
- 14.7.31 The details set out in the Outline Drainage Strategy (presented in Appendix 14B in PEI Report Volume III) represent a high-level outline drainage design concept which will be developed through detailed design phase in response to requirements identified through the detailed design process.

Decommissioning

- 14.7.32 The impact avoidance measures for decommissioning will be similar to those identified above for construction.
- 14.7.33 A detailed Decommissioning Environmental Management Plan will be prepared to identify required measures to prevent pollution during this phase of the development, based on the detailed decommissioning plan.

14.8 Limitations or Difficulties

14.8.1 The following assumptions have been applied throughout this assessment process, but are not considered to significantly affect the robustness of the assessment:

- a conceptual design for the Proposed Development and Outline Drainage Strategy has been completed and whilst detailed design will be undertaken prior to construction of the Proposed Development, it is unlikely that detailed design will change the outcome of the assessment; and
- similarly, as no details of construction techniques are available, it is assumed that standard best practice construction techniques would be used.

14.8.2 Further information of the connections associated with the drainage network will be sought at the detailed drainage strategy design phase.

14.9 Residual Effects and Conclusions

14.9.1 A summary of the residual effects is provided in Table 14.7 (using the approach set out in Table 14.6). Only those effects during construction, operation and maintenance of the Proposed Development that have been assessed as 'minor', 'moderate' or 'major' prior to mitigation are included (i.e. not those classified as 'negligible'). Mitigation measures relevant to each activity associated with a potentially significant adverse effect are set out in Table 14.7 and also outlined in the Framework CEMP in Appendix 5A in PEI Report Volume III.

14.9.2 Table 14.7 also confirms whether the incorporation of the mitigation measures identified above will result in a reduction in the magnitude and/ or probability of impacts on sensitive water receptors or whether they have a net adverse or beneficial impact.

Table 14.7: Summary of residual effects

IMPACT FROM ACTIVITY	DESCRIPTION OF POTENTIAL EFFECTS (PRIOR TO MITIGATION)		MITIGATION MEASURES (IMPACT AVOIDANCE)	DESCRIPTION OF RESIDUAL EFFECTS	
	DESCRIPTION	SIGNIFICANCE		DESCRIPTION	SIGNIFICANCE
CONSTRUCTION					
A - potential change to the surrounding land drains (culverting)	If an access bridge from South Marsh Road is proposed across Land Drain 1 in the north-eastern corner of the Main Development Area, then there is the potential for an impact on the flood risk from the watercourse; with a medium nature of effect.	Minor adverse	Any proposed culvert beneath the bridge will be adequately sized to convey the equivalent maximum flow as the ditch itself currently exhibits. This existing flow capacity would need to be assessed at the detailed design stage to inform the choice of culvert size used. Agreement would need to be sought from the NEL IDB on the structure used.	The new culvert would reduce the probability of effects occurring to medium, and in the event of the effect occurring, reduce the magnitude to negligible.	Negligible
B - potential loss of floodplain storage and temporary changes to flood water flow routing within Flood Zone 3 during construction of the Proposed Development (although the Site benefits from flood	The Environment Agency's modelling has illustrated that there is a very low/ negligible risk of fluvial flooding to the Site from the Land Drains 1 to 5, Middle Drain or Oldfleet Drain. The residual high risk of tidal flooding (Flood Zone 3) would only be incurred in the unlikely event that the Humber Estuary defences	Minor adverse and Negligible	No mitigation is considered necessary to further reduce the residual risk of floodwater re-routing to the local watercourses due to any stockpiles, buildings or access ramps in the event of an overtopping or breach failure in the Humber Estuary defences.	n/a	Minor adverse and Negligible

IMPACT FROM ACTIVITY	DESCRIPTION OF POTENTIAL EFFECTS (PRIOR TO MITIGATION)		MITIGATION MEASURES (IMPACT AVOIDANCE)	DESCRIPTION OF RESIDUAL EFFECTS	
	DESCRIPTION	SIGNIFICANCE		DESCRIPTION	SIGNIFICANCE
defences)	were overtopped or experienced a breach failure. Oldfleet Drain is of medium character receptor importance. Construction activities have the potential to affect the water quality of these drains with the nature of the effect being low (medium probability, reversible and medium term adverse effects on the water quality). The rest of the watercourses have a low character receptor importance and low impact as a result of construction activities.				
C - pollution of surface watercourses within or near the Site during construction of the Proposed Development	Land Drain 1 and Land Drain 2 are each of low character receptor importance. Construction activities associated with the Proposed Development have the potential to affect the water quality of these drains with the nature of	Minor adverse	Temporary drainage and settlement Installation of measures such as silt fences, appropriately sized settlement tanks/ ponds to reduce sediment load, vehicle restrictions and siting of materials and	Incorporation of these mitigation measures will reduce the probability of effects occurring to low, and in the event of the effect occurring, reduce the magnitude to low.	Negligible

IMPACT FROM ACTIVITY	DESCRIPTION OF POTENTIAL EFFECTS (PRIOR TO MITIGATION)		MITIGATION MEASURES (IMPACT AVOIDANCE)	DESCRIPTION OF RESIDUAL EFFECTS	
	DESCRIPTION	SIGNIFICANCE		DESCRIPTION	SIGNIFICANCE
	<p>the effect of medium (medium probability, reversible and medium term adverse effects on the water quality).</p> <p>Oldfleet Drain is of medium character receptor importance. Construction activities have the potential to affect the water quality of these drains with the nature of the effect of low (medium probability, reversible and medium term adverse effects on the water quality).</p>		<p>contingency measures.</p> <p>Mitigation measures and best practice outlined in a CEMP.</p>		
D - change to the impermeable area within the Site, and associated changes to surface water flows during construction of the Proposed Development	Land Drain 1 and Land Drain 2 are currently understood to receive lateral inflows of surface water runoff from the greenfield area of the proposed Main Development Area. The likely character of these watercourses is low with the nature of the effect of high (high probability,	Moderate adverse	It is proposed that as part of the Outline Drainage Strategy for the Site that discharge rates and volumes of surface water runoff from the Proposed Development are restricted to the existing greenfield runoff rates up to the 1% AEP event including a +40% allowance for climate change in	Incorporation of these mitigation measures will reduce the probability of effects occurring to low, and in the event of the effect occurring, reduce the magnitude to medium.	Minor adverse

IMPACT FROM ACTIVITY	DESCRIPTION OF POTENTIAL EFFECTS (PRIOR TO MITIGATION)		MITIGATION MEASURES (IMPACT AVOIDANCE)	DESCRIPTION OF RESIDUAL EFFECTS	
	DESCRIPTION	SIGNIFICANCE		DESCRIPTION	SIGNIFICANCE
	reversible and high short term adverse effects on the flood risk and drainage).		accordance with the Environment Agency, NELC, NEL IDB, NPS and NPPF PPG requirements. It is proposed that this will be achieved through directing runoff into an attenuation SuDS feature (pond) allocated at the eastern edge of the Proposed Development. This will have a controlled outfall (such as a HydroBrake) to limit the discharges into Land Drain 1 or Land Drain 2. This would potentially reduce the runoff rates and volumes into Land Drain 2 or Land Drain 1 respectively.		
OPERATION AND MAINTENANCE					
E - change to the impermeable area within the Site, and associated changes to surface water flows during	As per Potential Impact D (above).	Moderate adverse	As per Potential Impact D (above). It is also proposed as part of the Outline Drainage Strategy for the Site that in order to reduce the risk	As per Potential Impact D (above).	Minor adverse

IMPACT FROM ACTIVITY	DESCRIPTION OF POTENTIAL EFFECTS (PRIOR TO MITIGATION)		MITIGATION MEASURES (IMPACT AVOIDANCE)	DESCRIPTION OF RESIDUAL EFFECTS	
	DESCRIPTION	SIGNIFICANCE		DESCRIPTION	SIGNIFICANCE
operation and maintenance of the Proposed Development			of blockage, failure and capacity exceedance of the drainage infrastructure, maintenance of the system defined in a manual will be incorporated in general site management procedures and remains the responsibility of The Applicant.		
F- potential loss of floodplain storage as the footprint of the Proposed Development is located within Flood Zone 3	The Environment Agency's modelling has illustrated that there is a very low/ negligible risk of fluvial flooding to watercourses. The residual high risk of tidal flooding (Flood Zone 3) would only be incurred in the unlikely event that the Humber Estuary defences were overtopped or experienced a breach failure. No land raising is proposed at the Site but potential impact on the local watercourses as a	Minor adverse	Flood Emergency Response Plan. Emergency access and egress from Site. Place of safe refuge and critical equipment elevated above the maximum breach floodwater level (>4.60 mAOD).	Incorporation of these mitigation measures will reduce the probability of effects occurring to low, and in the event of the effect occurring, reduce the magnitude to low.	Negligible

IMPACT FROM ACTIVITY	DESCRIPTION OF POTENTIAL EFFECTS (PRIOR TO MITIGATION)		MITIGATION MEASURES (IMPACT AVOIDANCE)	DESCRIPTION OF RESIDUAL EFFECTS	
	DESCRIPTION	SIGNIFICANCE		DESCRIPTION	SIGNIFICANCE
	<p>result of the tidal floodwater volume capacity being reduced if a defence breach/ overtopping event were to occur resulting from the building walls or access ramps present within the Site as these would only partly displace a negligible amount of floodwater in comparison to the tidal inundation volume.</p> <p>No significant increase in the localised flood risk to the neighbouring watercourses would therefore be incurred, as these would be already be fully submerged by the tide.</p> <p>Oldfleet Drain is of medium character. Operational activities have the potential to affect the flood risk and drainage with the nature of the effect of low</p>				

IMPACT FROM ACTIVITY	DESCRIPTION OF POTENTIAL EFFECTS (PRIOR TO MITIGATION)		MITIGATION MEASURES (IMPACT AVOIDANCE)	DESCRIPTION OF RESIDUAL EFFECTS	
	DESCRIPTION	SIGNIFICANCE		DESCRIPTION	SIGNIFICANCE
G - pollution of surface watercourses within or near the Site during operation of the Proposed Development	<p>Land Drains 1 and 2 are of low character. Construction activities have the potential to affect the water quality of these drains with the nature of the effect of medium (medium probability, reversible and medium-term adverse effects on the water quality).</p> <p>Oldfleet Drain is of medium character. Construction activities have the potential to affect the water quality of these drains with the nature of the effect of low (medium probability, reversible and medium term adverse effects on the water quality).</p>	Minor adverse	Impact avoidance measures including spill kits and contaminant measures to be integrated into the operator's Environmental Management System	Incorporation of these mitigation measures will reduce the probability of effects occurring to low, and in the event of the effect occurring, reduce the magnitude to low.	Negligible

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15.0 SOCIO-ECONOMICS

15.1 Introduction

- 15.1.1 This chapter of the Preliminary Environmental Information (PEI) Report provides an initial assessment of the potential socio-economic impacts as a result of the construction, operation (including maintenance) and decommissioning of the Proposed Development and reports on the potential effects on employment, local businesses and the local population.

15.2 Legislation and Planning Policy Context

National Planning Policy

- 15.2.1 The Overarching National Policy Statement (NPS) for Energy (EN-1) (Department of Energy and Climate Change, 2011) states that socio-economic effects should be considered where a development has the potential for effects at the local or regional level. The NPS states (at paragraph 5.12.3) that all relevant impacts should be assessed including:
- *“creation of jobs and training opportunities;*
 - *...the impact of a changing influx of workers during the different construction, operation and decommissioning phases of the energy infrastructure...; and*
 - *cumulative effects – if development consent were to be granted to for a number of projects within a region and these were developed in a similar timeframe, there could be some short-term negative effects, for example a potential shortage of construction workers to meet the needs of other industries and major projects within the region.”*
- 15.2.2 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2019) requires local authorities to set out a clear economic vision and strategy for their area which encourages sustainable economic growth. The NPPF states that planning policies should help create the conditions in which businesses can invest, expand and adapt.
- 15.2.3 Paragraph 80 of the NPPF states that *“Significant weight should be placed on the need to support economic growth and productivity, taking into account both local business needs and wider opportunities for development.”* The NPPF indicates that this approach will allow areas to build on their strengths especially in areas of high productivity. Paragraph 82 of the NPPF also states that planning policies should *“recognise and address the specific locational requirements of different sectors.”*

Regional Planning Policy

The Humber Local Enterprise Partnership (LEP) Strategic Economic Plan 2014-2020 (2014)

- 15.2.4 The Humber Strategic Economic Plan (SEP) outlines its ambition to *“maximise the potential offered by the Humber Estuary, leading the Humber to become a renowned national and international centre for renewable energy and an area whose economy is resilient and competitive.”* It highlights the national importance of the Humber Energy Estuary and its role in the economic development of the Humber LEP area. It aims to *“Ensure that the appropriate infrastructure, supply of skilled labour and business support services are in place to drive the growth of the Energy Estuary, maintain the Humber’s competitiveness and maximise the benefits of new inward investment for local people and businesses.”*

The Humber's Blueprint for an Industrial Strategy (2018)

- 15.2.5 Following on from the delivery of the Humber SEP, the Humber LEP is in the process of developing an Industrial Strategy for the region which will build on the strengths of the Energy Estuary. The Blueprint for an Industrial Strategy sets out the Humber LEP's plan for delivering an Industrial Strategy focussing on four sectors where the Humber has strengths including clean energy. It highlights the Humber's leading role in energy production including energy from waste, and the contribution it can make to the UK Industrial Strategy.

Greater Lincolnshire LEP Strategic Economic Plan 2014-2032 (2016)

- 15.2.6 The Greater Lincolnshire SEP outlines the priorities for economic growth in the Greater Lincolnshire area. This includes the growth of the area's strongest sectors such as the low carbon economy including energy from waste. It also highlights the LEP's ambitions for the Humber Energy Estuary to become a leading national and international centre for energy. The Greater Lincolnshire SEP also outlines priorities for the manufacturing/engineering sector including support for growth in the renewable energy sector along the South Humber Bank complex through the provision of infrastructure and land assembly to unlock the development of key sites.

Local Planning Policy*North East Lincolnshire Local Plan 2013-2032 (Adopted 2018)*

- 15.2.7 The spatial vision for the North East Lincolnshire stated in the Local Plan includes *"By 2032 North East Lincolnshire will be nationally and internationally recognised as a centre for offshore renewables, focusing on operations and maintenance and contributing significantly to the Humber's 'Energy Estuary' status. Growth in key sectors, food, energy, chemicals, ports and logistics, will be matched by a strong tourism and leisure offer."*
- 15.2.8 Strategic objective SO3 (Economy) commits to *"Support environmentally responsive local economic growth by promoting conditions that sustain an increase in the number of better paid jobs; removing barriers to investment and access to jobs."*
- 15.2.9 Policy 1 (Employment Land Supply) supports the development of sites to accommodate B class uses in North East Lincolnshire. It aims to support the generation of 8,800 jobs including through growth in the Renewables and Energy sector.
- 15.2.10 Policy 8 (Existing Employment Areas) safeguards existing employment areas and supports the development or re-use of vacant sites within existing employment areas for employment use.

North East Lincolnshire Economic Strategy (2016)

- 15.2.11 The North East Lincolnshire Economic Strategy outlines three main outcomes for North East Lincolnshire (NEL): *"NEL's businesses invest and grow; NEL's workforce is skilled and productive; and NEL is a great place to live, work, visit and invest"*. Creating the right conditions for the growth of existing businesses and inward investment is seen as key. The Economic Strategy highlights the need for effective business support across sectors including in Renewable Energy due to the significant role the Humber Estuary plays in the sector and its contribution to local employment and skills development.

Other Guidance

- 15.2.12 Whilst there is no dedicated UK legislation that details the content required for a socio-economic assessment as part of an Environmental Impact Assessment (EIA), the socio-economic assessment presented in this Chapter is based upon a range of relevant guidance. This includes:

- Research to Improve the Assessment of Additionality (Department for Business, Innovation and Skills, 2009);
- The Green Book: Central Government Guidance on Appraisal and Evaluation (HM Treasury, 2018);
- The Magenta Book: Guidance for evaluation (HM Treasury, 2011); and
- Additionality Guide (Fourth Edition) (Homes and Communities Agency, 2014).

15.3 Assessment Methodology and Significance Criteria

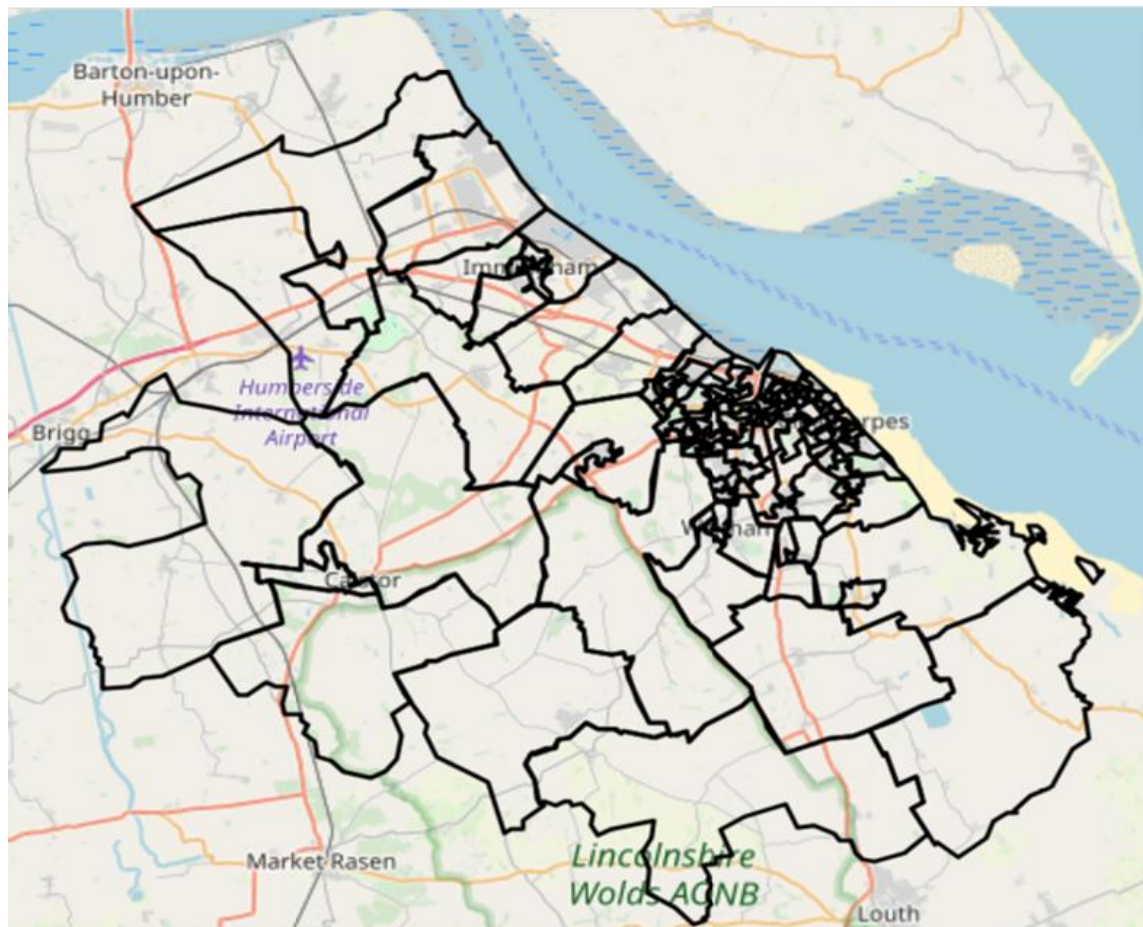
- 15.3.1 This assessment considers the role of the Proposed Development in the generation of direct and indirect employment opportunities at the local and regional level during construction, operation (including periods of maintenance) and decommissioning.
- 15.3.2 As described in Chapter 4: The Proposed Development and Chapter 5: Construction Programme and Management, three possible construction programme scenarios have been identified for the purposes of assessment. Although there is no difference in the scale and duration of construction for all three scenarios, the worst case scenario for the socio-economics construction assessment would be the scenario where the additional elements required for the Proposed Development were constructed part way through the construction of the Consented Development (referred to as Scenario 1 in Chapter 5: Construction Programme and Management). In this scenario the Proposed Development would not create any additional socio-economic impacts (as noted in paragraph 15.6.27 below). However as the EIA Scoping Opinion requires that the EIA considers and assesses the environmental impacts of the Proposed Development in isolation, an assessment of the total construction impacts and effects is presented in paragraphs 15.6.1 to 15.6.25 below.

Definition of the Study Area

- 15.3.3 The Office of National Statistics (ONS) statistical geographies have been used to define the study area for the socio-economic assessment as described below.
- 15.3.4 The Site falls within Lower Super Output Area (LSOA) North East Lincolnshire 007A (the 'Direct Impact Area') (see Plate 15.1). LSOAs are small geographic areas defined by the ONS. There are 34,753 LSOAs across England and Wales with a minimum population of 1,000 and a maximum of 3,000. The Direct Impact Area is located in North East Lincolnshire, between the settlements of Immingham to the north-west and Grimsby to the south-east. The Site is located in the north-east corner of the Direct Impact Area, close to the adjacent LSOA North East Lincolnshire 007B and the River Humber. The Direct Impact Area extends further to the south-west, away from the River Humber.

Plate 15.1: Map of Direct Impact Area (LSOA North East Lincolnshire 007A)

- 15.3.5 As well as understanding the socio-economic conditions immediately surrounding the Site (as per the LSOA analysis), the socio-economic assessment also takes into account the principal labour market catchment area of the travel to work area (TTWA). TTWAs contain at least 75% of the area's workforce that both live and work in the area. TTWAs have populations of at least 3,500 people. The Site falls within the Grimsby TTWA (the 'Wider Impact Area'). The Grimsby TTWA features the town of Grimsby as its employment centre, also covering other local settlements including Cleethorpes and Immingham. The Site is located relatively centrally in the TTWA, located between the two largest settlements of Grimsby and Immingham (see Plate 15.2).

Plate 15.2: Map of Wider Impact Area (Grimsby TTWA)

- 15.3.6 The assessment outlines the socio-economic context of both the Direct Impact Area and the Wider Impact Area (together being the 'Study Area') and makes comparisons to the whole of England. Key indicators include: population and labour force; skills and unemployment; industry and the economy.

Sources of information

- 15.3.7 The following ONS datasets have been reviewed to inform the assessment: Business Register and Employment Survey (BRES) (2018); Jobseeker's Allowance by Occupation (2019); Census of Population (2011); and Population Projections (2015).
- 15.3.8 Where possible, socio-economic impacts have been appraised against relevant national standards, such as those provided by HM Treasury, the Department for Business, Innovation and Skills (now Department for Business, Energy and Industrial Strategy), and Homes and Communities Agency (now Homes England). Where relevant standards do not exist, professional experience and expert judgement have been applied.
- 15.3.9 The socio-economic assessment determines the:
- sensitivity of receptors (as defined below);
 - magnitude of impacts; and
 - consequent significance of effects.

Sensitivity (Value)

15.3.10 The sensitivity of socio-economic receptors is assessed as high, medium, low or very low. The socio-economic receptors include those who will potentially benefit from employment generation (either directly, indirectly or induced (secondary impacts, for example due to construction workers spending money at local businesses)). The sensitivity of these receptors is considered to be high due to the availability of the labour and skills in the local area that are required for the Proposed Development.

15.3.11 Section 15.4 (Baseline Conditions) summarises the receptors that will be affected during construction, operation (including maintenance) and decommissioning of the Proposed Development.

Assessment of Magnitude

15.3.12 The magnitude of the impacts of the Proposed Development is assessed as being high, medium, low or very low. This is determined by:

- extent of change – the absolute number of people affected and the size of the area in which effects will be experienced i.e. the level of change to baseline conditions, including the proportion of the existing workforce;
- scale of the impact – the relative magnitude of each impact in its relevant market context (for example, the effects on local employment will be considered in the context of the overall size of the local labour market); and
- duration of impact – more weight is given to long-term, permanent changes than to short-term, temporary ones. Temporary to short-term impacts are considered to be those associated with the construction and/ or decommissioning phases. Medium to long-term impacts are those associated with the operation of the Proposed Development.

Assessment of Significance

15.3.13 The effects of the Proposed Development are defined as either:

- beneficial – an advantageous or beneficial effect on an impact area;
- neutral – an imperceptible effect on an impact area; or
- adverse – a disadvantageous or negative effect on an impact area.

15.3.14 Where an effect is assessed as being beneficial or adverse, the effect has been classified as minor, moderate, major or negligible. The magnitude of the change and the value of the receptor will be used to determine the significance of effects caused. Significant effects will be those identified as being moderate or major (adverse or beneficial) as set out in Table 15.1. For the purposes of this assessment, only moderate and major impacts are considered 'significant'.

Table 15.1: Classification of effects on socio-economics

MAGNITUDE OF IMPACT	SENSITIVITY/IMPORTANCE OF RECEPTOR			
	High	Medium	Low	Very Low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very low	Minor	Negligible	Negligible	Negligible

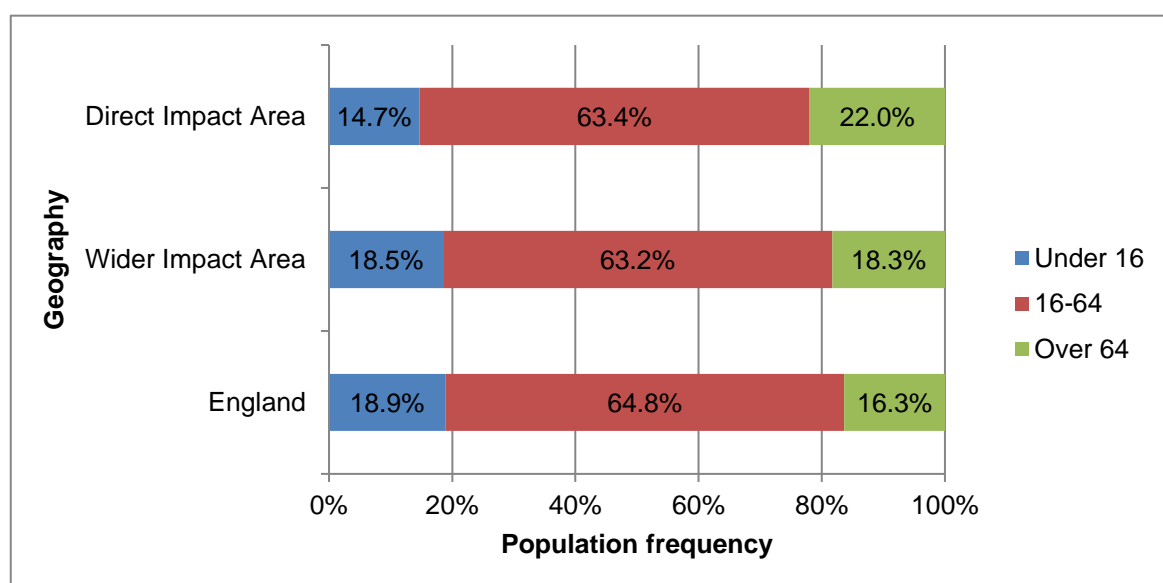
Consultation

- 15.3.15 This assessment has been prepared in accordance with the EIA Scoping Report submitted to the Planning Inspectorate in August 2019, and the EIA Scoping Opinion received in October 2019.
- 15.3.16 During consultation on the scope of the EIA for the Consented Development, North East Lincolnshire Council (NELC) requested that the EIA should demonstrate impacts upon the labour force, impacts of construction, and how this would impact on the economic prosperity of the area (refer to Section 15.6). NELC also requested that the assessment of socio-economics should demonstrate how the LEP strategy for the Humber Estuary for Energy would be met (refer to Sections 15.6 and 15.9).
- 15.3.17 The Scoping Opinion received from PINS on 2nd October 2019 included no comments on the scope of the socio-economic assessment. The consultation response by NELC to PINS explained that the EIA Scoping Report captured the relevant information requested by NELC in the scoping opinion in respect of the Consented Development and that NELC have no further comments.

15.4 Baseline Conditions

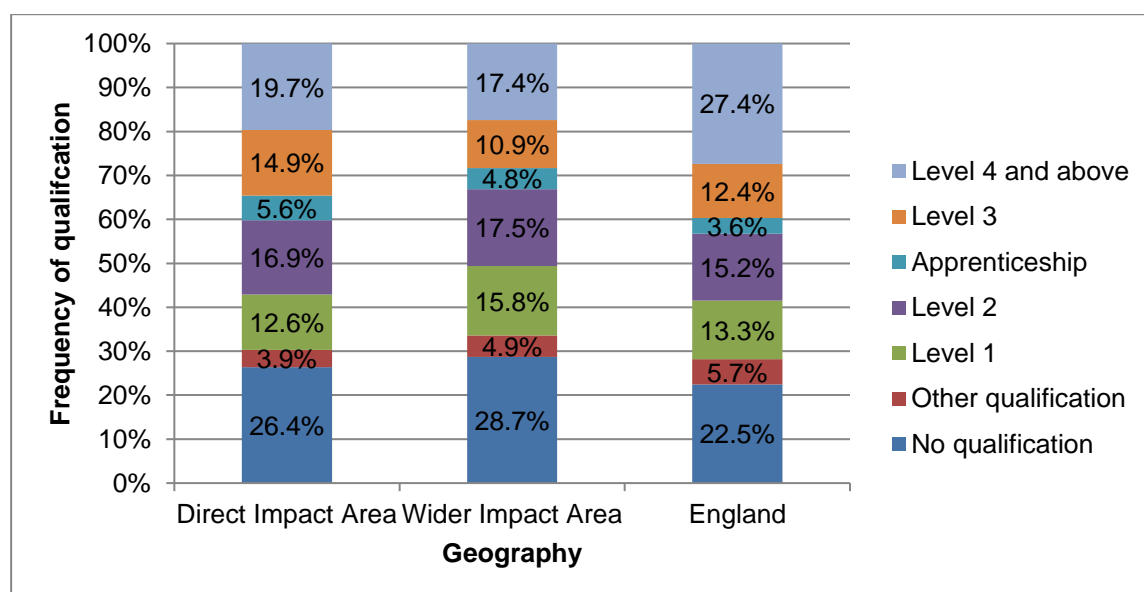
- 15.4.1 This section outlines the socio-economic baseline conditions in the Study Area itself against England as a whole. The local population and labour market are the main receptors in the assessment for employment effects. The baseline conditions help to determine the impact of employment generated by the Proposed Development on the local population and labour market. The impact is mostly influenced by the size of the labour market and whether it has the relevant skills, occupations and sector strengths.
- 15.4.2 The 2011 Census data shows that the Direct Impact Area had a population of 1,234 while the Wider Impact Area had a population of 187,068 (ONS, 2011). Plate 15.3 shows that the Direct Impact Area had a smaller proportion of young people (aged 0 to 15) than both the Wider Impact Area and England. Both the Direct Impact Area and Wider Impact Area contain less people of working age (aged 16 to 64) than the national average. There are a higher proportion of residents aged over 64 in the Direct Impact Area than in both the Wider Impact Area and England as a whole.

Plate 15.3: Age structure of residents (source: census (ONS, 2011))



- 15.4.3 Plate 15.4 shows that the Direct Impact Area has fewer residents qualified to Level 4 and above (19.7%) than England as a whole (27.4%), but more than the Wider Impact Area (17.4%). However, there are more residents qualified to Level 3 in the Direct Impact Area (14.9%) than both the Wider Impact Area (10.9%) and England (12.4%).
- 15.4.4 At the other end of the spectrum there are fewer residents in the Direct Impact Area with no qualifications (26.4%) when compared to the Wider Impact Area (28.7%), but more than in England as a whole (22.5%). There are fewer residents with 'other qualifications' than the Direct Impact Area (3.9% as against 4.9%) and fewer residents with 'other qualifications' than in England as a whole (3.9% as against 5.7%). These figures are broken down in Plate 15.4 below.

Plate 15.4: Highest level of qualification of residents (source: census (ONS, 2011))



- 15.4.5 Table 15.2 shows that the largest employment sector in the Direct Impact Area is manufacturing with 16.6% of residents employed in the sector, more than in the Wider Impact Area (15.2%) and England as a whole (8.8%). Other key employment sectors in the Direct Impact Area include wholesale and retail (including repair of motor vehicles) (15.6%), human health and social work activities (13.0%), and transport and storage (11.7%).

Table 15.2: Employment by sector (source: census (ONS, 2011))

SECTOR	DIRECT IMPACT AREA	WIDER IMPACT AREA	ENGLAND
Manufacturing	16.6%	15.2%	8.8%
Wholesale and retail trade (including repair of motor vehicles)	15.6%	18.5%	15.9%
Human health and social work activities	13.0%	13.0%	12.4%
Transport and storage	11.7%	7.8%	5.0%
Construction	8.1%	8.3%	7.7%
Public administration and defence; compulsory social security	7.8%	4.9%	5.9%
Education	7.5%	9.1%	9.9%
Professional, scientific and technical activities	4.1%	3.6%	6.7%
Administrative and support service activities	3.9%	4.2%	4.9%
Accommodation and food service activities	3.6%	5.3%	5.6%
Agriculture, forestry and fishing	2.4%	1.2%	0.8%
Financial and insurance activities	2.0%	1.3%	4.4%
Other	3.7%	7.6%	12.0%

15.4.6 More residents aged between 16 and 74 are economically active in the Direct Impact Area (70.6%) than in the Wider Impact Area (68.3%) or England as a whole (69.9%). A large proportion of residents are in employment (65.0%) compared to the Wider Impact Area (59.7%) and England (62.1%). The percentage of residents who are unemployed is low compared to the wider areas. This is broken down in Table 15.3.

Table 15.3: Economic activity (source: census (ONS, 2011))

ECONOMIC ACTIVITY	DIRECT IMPACT AREA		WIDER IMPACT AREA		ENGLAND	
	NO.	% OF RESIDENTS (AGED 16-74)	NO.	% OF RESIDENTS (AGED 16-74)	NO.	% OF RESIDENTS (AGED 16-74)
In employment	599	65.0%	81,550	59.7%	24,143,464	62.1%
Employee: Part-time	122	13.2%	22,146	16.2%	5,333,268	13.7%
Employee: Full-time	401	43.5%	49,518	36.3%	15,016,564	38.6%
Self-employed	76	8.3%	9,886	7.2%	3,793,632	9.8%
Un-employed	32	3.5%	8,102	5.9%	1,702,847	4.4%
Full-time student	19	2.1%	3,575	2.6%	1,336,823	3.4%
Total	650	70.6%	93,227	68.3%	27,183,134	69.9%

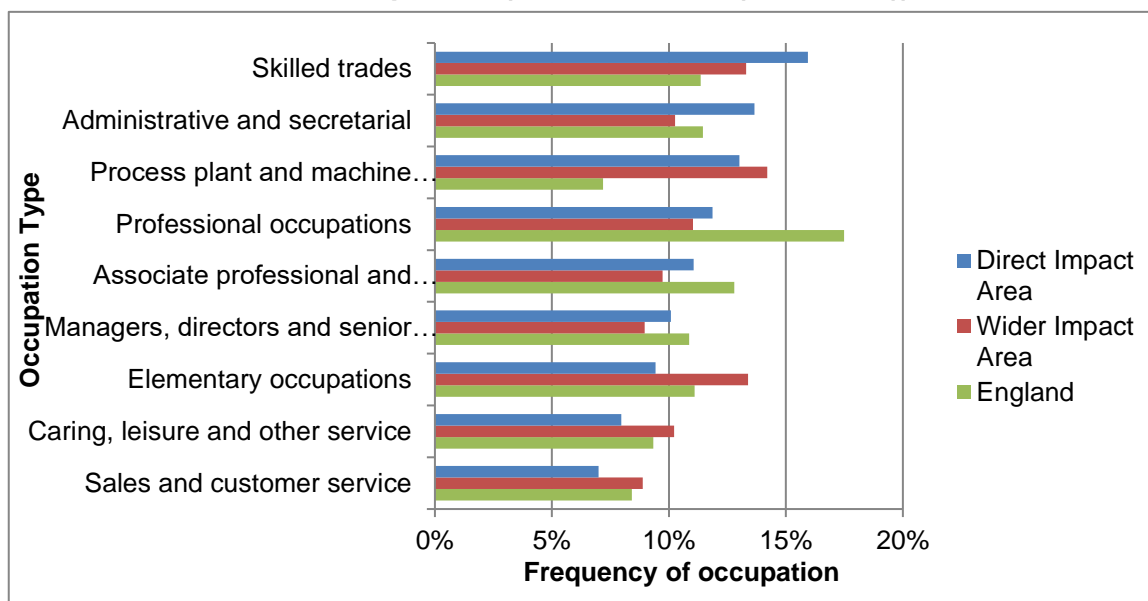
15.4.7 There are fewer economically inactive residents aged between 16 and 74 in the Direct Impact Area (29.4%) than in the Wider Impact Area (31.7%) and England as a whole (30.1%). However, a higher proportion of residents in the Direct Impact Area are retired (19.5%) when compared to the Wider Impact Area (16.3%) and England as a whole (13.7%). This is broken down in Table 15.4.

Table 15.4: Economic inactivity (source: census (ONS, 2011))

ECONOMIC INACTIVITY	DIRECT IMPACT AREA		WIDER IMPACT AREA		ENGLAND	
	NO.	% OF RESIDENTS (AGED 16-74)	NO.	% OF RESIDENTS (AGED 16-74)	NO.	% OF RESIDENTS (AGED 16-74)
Retired	180	19.5%	22,212	16.3%	5,320,691	13.7%
Student (including full-time students)	20	2.2%	5,535	4.1%	2,255,831	5.8%
Looking after home or family	37	4.0%	6,400	4.7%	1,695,134	4.4%
Long-term sick or disabled	28	3.0%	6,292	4.6%	1,574,134	4.0%
Other	6	0.7%	2,822	2.1%	852,450	2.2%
Total	271	29.4%	43,261	31.7%	11,698,240	30.1%

- 15.4.8 As shown in Plate 15.5, skilled trades dominate the workforce occupations in the Direct Impact Area, with 15.9% of employed residents in this occupation. This is compared to 13.3% in the Wider Impact Area and 11.4% in England as a whole. This is followed by administrative and secretarial, and process plant and machine operatives. There is a notably-greater frequency of process plant and machine operatives in the Direct Impact Area (13.0%), and the Wider Impact Area (14.2%) than in England as a whole (7.2%). Compared to England as whole, the Direct Impact Area is underrepresented in professional occupations, with 11.9% of residents compared to England's 17.5%.

Plate 15.5: Workforce occupations (source: census (ONS, 2011))



Deprivation

- 15.4.9 Deprivation in small areas in England is measured by the Index of Multiple Deprivation (Department for Communities and Local Government, 2015) which ranks every LSOA in England from 1 (most deprived area) to 32,844 (least deprived area). These are based on seven key measures: 'Income Deprivation', 'Employment Deprivation', 'Education, Skills and Training Deprivation', 'Health Deprivation and Disability', 'Crime', 'Barriers to Housing and Services', and 'Living Environment Deprivation'.
- 15.4.10 The Direct Impact Area falls within the 45% least deprived areas in the country based on the overall Index of Multiple Deprivation measure. On the 'Barriers to Housing and Services' domain, the Direct Impact Area is ranked just outside the top third of most deprived areas in England (based on this measure). The next most pressing domain is the 'Health Deprivation and Disability' measure, with the area featuring just outside of the 50% most deprived areas in England. The best performing domain is the 'Crime' domain, where the area is amongst the 20% least deprived neighbourhoods in England.
- 15.4.11 The Direct Impact Area is located next to the highly deprived LSOA North East Lincolnshire 006A which features in the top 3% of deprived areas in the country. The 006A area particularly suffers in the Income Deprivation measure, featuring in the top 1% of deprived areas in the country based on Income Deprivation.

Local Receptors

- 15.4.12 No residential properties lie within direct proximity of the Site (within 500 m). The nearest properties are approximately 1 km away (South Marsh Road and Station Road).

- 15.4.13 No social infrastructure lies within direct proximity to the Site. Immingham East Fire Station is located 2.5 km west of the Site, outside of the town of Immingham. The closest school is the Stallingborough Church of England Primary School located 2.7 km to the south-west of the Site.
- 15.4.14 The existing South Humber Bank Power Station is located directly adjacent to the west of the Main Development Area. A dedicated entrance will be provided for the Proposed Development to reduce impact on the power station. There are a number of businesses located close to the Site. Directly to the north of the Site is Synthomer (UK) (a polymer manufacturer). Approximately 250 m to the north of the Site is the NEWLINCS waste management facility (an integrated waste management company). Approximately 430 m to the south-east of the Site is Lenzing Fibers (a producer of fibres). Technical Absorbents (a producer of super absorbents) is located approximately 900 m to the south-east of Site, with BASF Performance Products (a chemical manufacturer) 1.4 km to the south-east of the Site. To the north-west is BOC Gases (a gas supplier) 740 m from the Site, BCA Automotive (a car importer) 1.1 km from the Site, and Tronox (a chemicals business) approximately 1.7 km from the Site.

Future Baseline

- 15.4.15 Table 15.5 highlights projected population figures for the Study Area. The population in the Direct Impact Area is expected to fall between 2011 and 2041 (-0.07%)¹. This is opposed to the Wider Impact Area (0.32%) and England as a whole (0.54%) which both display an opposite, increasing trend. In all areas the strongest growth is apparent in the age 65+ cohort. Working aged population is projected to decline in both the Direct Impact Area (-0.50%) and the Wider Impact Area (-0.05%). Working aged population in England as a whole (0.18%) also shows the slowest level of growth. All areas are therefore expecting an increasingly aging population with this impact being greatest in the Direct Impact Area.

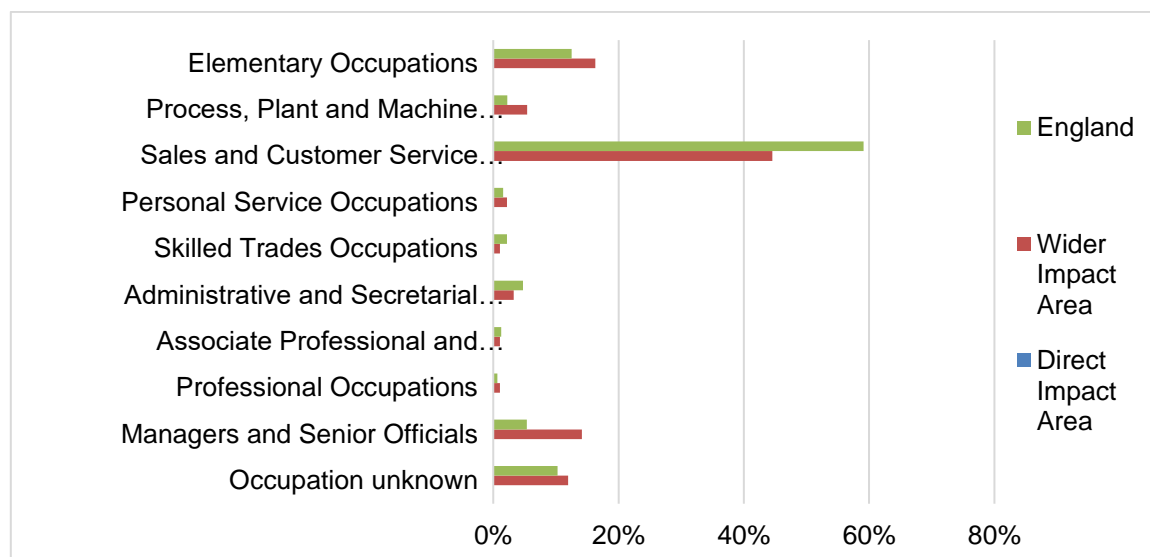
¹ Population projections to the year 2041 have been used as this is the furthest possible date available from the Office of National Statistics: 'Population estimates based by single year of age'

Table 15.5: Population projections

PROJECT- ED YEAR	DIRECT IMPACT AREA				WIDER IMPACT AREA				ENGLAND			
	ALL AGES	AGED 0 TO 15	AGED 16 TO 64	AGED 65+	ALL AGES	AGED 0 TO 15	AGED 16 TO 64	AGED 65+	ALL AGES	AGED 0 TO 15	AGED 16 TO 64	AGED 65+
2011	1,234	181	782	271	187,068	221,666	118,250	34,220	53,012,456	10,022,836	34,329,091	8,660,529
2016	1,236	183	756	302	192,083	228,479	118,117	38,712	55,268,067	10,529,100	34,856,126	9,882,841
2021	1,233	185	736	320	195,786	235,660	118,091	41,570	57,030,534	11,027,950	35,298,513	10,704,133
2026	1,227	176	720	346	198,815	232,936	118,029	45,466	58,505,621	11,048,393	35,659,571	11,797,633
2031	1,220	166	699	379	201,459	227,171	117,378	50,140	59,789,798	10,857,286	35,765,627	13,166,895
2036	1,214	161	681	402	203,507	224,772	116,247	54,102	60,905,483	10,779,344	35,788,796	14,337,402
2041	1,210	160	676	406	205,387	225,547	116,610	55,633	61,952,118	10,838,109	36,120,411	14,993,573
CAGR	-0.07%	-0.43%	-0.50%	1.41%	0.32%	0.06%	-0.05%	1.69%	0.54%	0.27%	0.18%	1.91%

- 15.4.16 Data for the Direct Impact Area shows no sought after occupations (see Plate 15.6 below). This does not mean there were zero sought after occupations across all job types but that none of the categories were large enough to warrant appearing within the ONS dataset. The dataset rounds to the nearest 5 for privacy purposes.
- 15.4.17 In the Wider Impact Area the most sought after occupation was Sales and Customer Service Occupations (45%) followed by Elementary Occupations (16%) and Managers and Senior Officials (14%). This trend does not vary greatly when analysing the data for England as a whole.
- 15.4.18 England's top four sought after occupations are Sales and Customer Service Occupations (59%), Elementary Occupations (13%), Managers and Senior Officials (5%), and Administrative and Secretarial Occupations (5%).
- 15.4.19 Sought after occupations are slightly more varied between roles in the Wider Impact Area compared to England as a whole; Sales and Customer Service Occupations dominate England's sought after occupations. The rounding of data limits the use of sought occupation analysis for the Direct Impact Area.

Plate 15.6: Sought occupations



- 15.4.20 A future baseline scenario including the Consented Development is also considered for completeness. The socio-economic assessment of the Consented Development considered a 'worst case' scenario for socio-economics whereby only a single-stream plant was constructed, a scenario that has subsequently been ruled out (see Chapter 6: Alternatives and Design Evolution). This assessment predicted that the Consented Development would have a major beneficial effect during construction (including net employment in the Grimsby TTWA of 219) and a moderate beneficial effect during operation (including net employment in the Grimsby TTWA of 38) due to employment generation.
- 15.4.21 Whilst the Proposed Development is compared against a future baseline without the Consented Development in the main assessment in Section 15.6 below, comparison of the effects of the Proposed Development against the effects of the Consented Development is also described (see paragraphs 15.6.26 to 15.6.33).

15.5 Development Design and Impact Avoidance

- 15.5.1 The Proposed Development will be situated on vacant land within the site of the existing South Humber Bank Power Station (SHBPS). If developed, this will maintain the Site as an energy generation employment site beyond the current anticipated lifetime of the SHBPS. A dedicated entrance to the Proposed Development will be provided in order to avoid impacts on the operation of the SHBPS.
- 15.5.2 The Applicant will host a careers fair to promote employment opportunities at the Proposed Development for local residents, and a "meet the buyer" event will be held to promote supply chain opportunities for local businesses.
- 15.5.3 A Combined Heat and Power (CHP) Assessment is being undertaken and will be submitted with the Application identifying potential opportunities for heat and/ or power offtake to local industrial users.

15.6 Likely Impacts and Effects

The Proposed Development

- 15.6.1 The impacts and effects of the Proposed Development compared to a future baseline without the Consented Development are described below.

Construction

Employment

- 15.6.2 Construction of the Proposed Development is expected to last approximately three years. During this time employment opportunities will be created as a result of the works.
- 15.6.3 Although these jobs are temporary, they represent a positive economic impact that can be estimated as a function of the scale and type of construction. This supports the Humber LEP's vision of job creation for residents in the Humber driven by growth in the energy sector and its aim to "*become a renowned national and international centre for renewable energy*". The Humber SEP indicates a need to ensure that a supply of skilled labour is in place to drive the growth of the Energy Estuary but also maximise opportunities from the investment for local people. Although it is recognised that many of the roles required to construct the Proposed Development will be specific construction contracting roles, the area has an above average proportion of the workforce employed in skilled trades so some demand may reasonably be met locally. The direct expenditure involved in the construction phase will also lead to increased output generated in the Grimsby TTWA economy.
- 15.6.4 The peak number of construction staff during the construction of the Proposed Development is predicted to be approximately 750 workers.

Leakage

- 15.6.5 Leakage refers to the proportion of jobs within a TTWA that are filled by residents living outside the TTWA (the Wider Impact Area). TTWAs reflect labour market commuting patterns where at least 75% of people living within an area also work there. The Proposed Development is within the Grimsby TTWA and the latest census data shows that the proportion of people who work in but live outside the Grimsby TTWA is 12.9% (ONS, 2018). However, many of the roles at the Proposed Development will be specialist roles and are likely to be from overseas or other construction sites in the UK. The HCA Additionality Guide (HCA, 2014) suggests 50% as a 'ready reckoner' for high levels of leakage. In addition, Department for Business, Innovation and Skills guidance (2009) suggests a leakage of 46% (upper end of range) for regeneration through physical infrastructure – capital projects at the sub-regional level.

- 15.6.6 Based on a worst case scenario, a 50% discount is applied to the 750 gross jobs created by the Proposed Development and, as such, it is estimated that 375 people from outside the Grimsby TTWA and 375 from within will benefit from working at the Proposed Development during the construction period.

Displacement

- 15.6.7 Displacement measures the extent to which the benefits of a project are offset by reductions of output or employment elsewhere. Any additional demand for labour cannot simply be treated as a net benefit – it removes workers from other posts and the net benefit is reduced to the extent that this occurs.
- 15.6.8 Overall it is assumed that due to the flexibility of a typical construction workforce (i.e. they quickly move from project to project) displacement effects are low. The HCA Additionality Guide (HCA, 2014) suggests 25% as a ‘ready reckoner’ for low levels of displacement (i.e. there are expected to be some displacement effects, although only to a limited extent). Applying this level of displacement to total gross direct employment in the Grimsby TTWA results in net direct employment of 563 arising from the Proposed Development during the construction period.

Multiplier Effect

- 15.6.9 In addition to the direct construction employment generated by the Proposed Development itself there will be an increase in local employment arising from indirect and induced effects of the construction activity. Employment growth will arise locally through manufacturing services and suppliers to the construction process (indirect or supply linkage multipliers). Additionally, part of the income of the construction workers and suppliers will be spent in the Grimsby TTWA, generating further employment (induced or income multipliers).
- 15.6.10 The impact of the multiplier depends on the size of the geographical area that is being considered, the local supply linkages and income leakage from the area. The HCA Additionality Guide (HCA, 2014) provides ‘ready reckoners’ of composite multipliers – the combined effect of indirect and induced multipliers. It has been assumed that the Grimsby TTWA has ‘average’ supply linkages based on the scale of its economy. This means that a multiplier of 1.3 has been used, as determined from the HCA guidance. Applying this multiplier of 1.3 generates an additional 169 indirect and induced jobs in the Grimsby TTWA arising from the Proposed Development during the construction period.

Net Construction Employment

- 15.6.11 Based on the gross construction worker requirements for construction of the Proposed Development and the additionality factors outlined above, 731 net construction jobs would be generated, of which 366 are expected to be from the Grimsby TTWA. This meets with Objective 8 of the Humber LEP’s SEP which highlights the need to ensure that “residents of the Humber are able to access good quality employment opportunities”
- 15.6.12 Table 15.6 presents the short-term construction employment created by the Proposed Development taking leakage, displacement and multiplier effects into account.

Table 15.6: Net construction employment in Grimsby TTWA (average no. of workers onsite per year)

CONSTRUCTION EMPLOYMENT	GRIMSBY TTWA	OUTSIDE OF GRIMSBY TTWA	TOTAL
Gross Direct Employment	375	375	750
Displacement	94	94	188
Net Direct Employment	281	281	563
Net Indirect/ Induced Employment	84	84	169
Total Net Employment	366	366	731

15.6.13 The sensitivity of receptors is considered as high. Taking into account the size of the labour pool of construction workers in the Grimsby TTWA (4,000 (BRES (2018))), the magnitude of impacts is considered to be high. For example, the gross direct employment required during the construction phase of the Proposed Development would account for around 18.3% of the existing construction workforce in the Grimsby TTWA. Therefore, the direct, indirect and induced employment created by the construction phase of the Proposed Development is likely to have a major beneficial short-term (significant) effect on the Grimsby TTWA's economy.

Wider Effects During the Construction Phase

15.6.14 The construction period for the Proposed Development will see a slight increase in vehicle movements (e.g. construction staff, delivery of materials and movement of excavated materials) which could impact on journey times for local residents during the peak of construction and other amenity effects such as increased noise levels. However, there are no high sensitivity receptors in direct proximity of the Proposed Development. Therefore, this impact is likely to be negligible adverse (not significant).

15.6.15 There are a number of businesses within proximity to the Proposed Development. Potential amenity effects could arise during construction (e.g. noise impacts and traffic impacts) which could affect these businesses. Noise and traffic impacts are assessed respectively in Chapter 8: Noise and Vibration and Chapter 9: Traffic and Transport. Overall it is determined that due to the nature of the existing businesses (mainly manufacturing) the impact is likely to be negligible adverse (not significant).

Operation

Employment

15.6.16 The Proposed Development will generate long-term jobs once operational including a number of highly skilled roles. This meets the long-term challenge outlined in the Humber LEP's SEP of increasing the number of highly skilled jobs across the Humber. These jobs also support the Humber SEP's main objective of becoming a recognised centre for energy generation.

15.6.17 The following analysis estimates gross operational employment arising from the operation of the Proposed Development and then takes into account deadweight (existing employment on Site), leakage, displacement and multiplier effects (to assess indirect jobs and induced employment) in order to assess net impacts on the sub-regional and national economies within the Study Area.

15.6.18 During the Proposed Development operational period, which will be approximately 30 years, employment will be generated in operative, management and maintenance roles in relation to the electricity generating element of the Proposed Development and its

maintenance. Precedents from elsewhere suggest that there will be approximately 56 gross direct jobs.

15.6.19 The Main Development Area is currently unoccupied and has no existing employment as such there is no existing employment and therefore no deadweight is applied.

15.6.20 Assuming leakage of 12.9% (percentage of people who work in but live outside the Grimsby TTWA), displacement of 25% (i.e. there are expected to be some displacement effects, although only to a limited extent), and a composite multiplier of 1.3 (as per the gross to net calculations for construction employment and as determined by the HCA Guidance (2014), as described at paragraph 5.6.10 above), it is estimated that the total net employment for the operational element of the Proposed Development will be 55 employees, of which 48 are predicted to be from the Grimsby TTWA. This is presented in Table 15.7.

Table 15.7: Net employment of the Proposed Development in operation

OPERATIONAL EMPLOYMENT	GRIMSBY TTWA	OUTSIDE OF GRIMSBY TTWA	TOTAL
Gross Direct Employment	49	7	56
Displacement	12	2	14
Net Direct Employment	37	5	42
Net Indirect/ Induced Employment	11	2	13
Total Net Employment	48	7	55

Maintenance

Employment

15.6.21 It is expected that each year the Proposed Development will be taken offline for approximately three weeks to allow for maintenance activities to be undertaken safely, including internal inspection of the boiler. Approximately every five to six years it will be taken offline for a major outage for other more substantial maintenance activities, including for example replacement of sections of the boiler. Such a major outage is likely to last approximately five weeks. Work will typically be undertaken 24 hours a day during the outage period and staffing levels will vary as each element of the works is completed. The peak number of employees on Site at any one time during a major outage is likely to be around 200 employees.

15.6.22 Assuming leakage of 75% (many of the maintenance roles will be specialist roles so employment benefits will go to people living outside of the TTWA), displacement of 25% (i.e. there are expected to be some displacement effects, although only to a limited extent), and a composite multiplier of 1.3 (as per the gross to net calculations for construction employment and as determined by the HCA Guidance (2014) – see paragraph 15.6.10 above), it is estimated that the total net employment for the maintenance element of the Proposed Development will be 195 employees, of which 146 are predicted to be from outside of the Grimsby TTWA. This is presented in Table 15.8.

Table 15.8: Net maintenance employment of the Proposed Development during outages

MAINTENANCE EMPLOYMENT	GRIMSBY TTWA	OUTSIDE OF GRIMSBY TTWA	TOTAL
Gross Direct Employment	50	150	200
Displacement	13	38	50
Net Direct Employment	38	113	150
Net Indirect/ Induced Employment	11	34	45
Total Net Employment	49	146	195

15.6.23 Taking into account the existing overall size of the labour pool in the Grimsby TTWA (78,000), the magnitude of impacts is considered to be low during the operational and maintenance phases of the Proposed Development. Therefore, the direct, indirect and induced employment created by the construction phase of the Proposed Development is likely to have a moderate beneficial long-term (significant) effect on the Grimsby TTWA's economy.

Decommissioning

15.6.24 The Proposed Development is expected to operate until at least 2052. At the end of its operating life, the most likely scenario is that the Proposed Development would be shut down and all above ground structures removed from the Site. There is limited information available at this stage regarding decommissioning methods and timescales, and the following is based on professional judgment considering the likely scope of works.

Employment

15.6.25 It is anticipated that staff employed during the decommissioning phase would have an effect on the economy by spending their wages in the same way that those employed during other stages would. It is envisaged that a comparable number of workers as would be employed during the construction phase of the Proposed Development (approximately 731 taking into account additional factors) would be employed for the decommissioning phase, although the actual numbers are uncertain at this stage. Overall the decommissioning phase of the Proposed Development is likely to have at least a minor beneficial (not significant) effect on employment in the local area.

Comparison of Proposed Development and Consented Development

15.6.26 The impacts and effects of the Proposed Development compared to a future baseline with the Consented Development are described below.

Construction

15.6.27 In overall terms the numbers of construction staff required for the Consented Development and the Proposed Development are the same.

15.6.28 It is noted that the socio-economics assessment for the Proposed Development presented in this Chapter concludes that construction employment for the Proposed Development would be higher than for the Consented Development, but this is because the socio-economics assessment for the Consented Development assessed the 'worst case' at that time (construction of a single stream plant), which has subsequently been discounted by the Applicant.

- 15.6.29 As such it is concluded that the Proposed Development will have no additional socio-economic effects during construction compared to the Consented Development.

Operation

- 15.6.30 As described above for construction, in overall terms the numbers of operational staff required for the Consented Development and the Proposed Development are the same, although it is noted that the assessment of the Consented Development predicted slightly lower employment than the assessment of the Proposed Development presented in this Chapter due to the adoption of a 'worst case' scenario of a single stream plant.
- 15.6.31 The frequency and scale of maintenance outages is also expected to be the same for the Proposed Development as for the Consented Development therefore the same number of staff required for maintenance had not changed.
- 15.6.32 It is therefore concluded that the Proposed Development will have no additional socio-economic effects during operation compared to the Consented Development

Decommissioning

- 15.6.33 The nature and scale of decommissioning activities required for the Proposed Development would be the same for the Proposed Development as for the Consented Development. The decommissioning of the Proposed Development is therefore predicted to have no additional socio-economic effects compared to the decommissioning of the Consented Development.

15.7 Mitigation and Enhancement Measures

- 15.7.1 No significant adverse effects are predicted during the construction, maintenance, operation and decommissioning of the Proposed Development, and as such no specific mitigation is required, there is a need to ensure local residents are able to secure the employment opportunities available.
- 15.7.2 No other additional mitigation measures, over and above that stated in the other technical chapters of this PEI Report, are required to avoid or minimise the socio-economic effects identified in this chapter.

15.8 Limitations or Difficulties

- 15.8.1 This initial socio-economic assessment is based on the available data at the time of writing (and as detailed herein) and has been based on a desk-based study with no site visits being undertaken. This is not considered to affect the robustness of the assessment.

15.9 Residual Effects and Conclusions

- 15.9.1 It is considered that the Proposed Development will have an overall positive economic effect on the Grimsby TTWA economy, through the provision of employment and through associated multiplier effects.
- 15.9.2 The creation of employment opportunities during both the construction and operation phases of the Proposed Development supports the objectives set out in the Humber LEP's SEP related to job creation, in particular skilled roles and the overall contribution to the growth of the energy sector in the Humber Estuary.
- 15.9.3 The residual significant effects associated with the Proposed Development are summarised in Table 15.9.

Table 15.9: Socio-economic predicted residual significant effects

EFFECT	SIGNIFICANCE	EXPLANATION
Net employment generated during the construction phase.	Major beneficial (significant) effect.	The estimated net employment generated during the construction phase is 731 workers per annum of which 366 are likely to be from the Grimsby TTWA.
Net employment generated during the operation phase.	Moderate beneficial (significant) effect.	The estimated net employment generated during the operational phase is 55 employees, of which 48 are likely to be from the Grimsby TTWA.

15.10 References

- Department for Business, Innovation and Skills (2009) *Research to Improve the Assessment of Additionality*
- Department for Communities and Local Government (2015) *English Indices of Deprivation*
- Department of Energy and Climate Change (2011) *Overarching National Policy Statement for Energy (EN-1)*
- Greater Lincolnshire Local Enterprise Partnership (2014) *Greater Lincolnshire Strategic Economic Plan*
- HM Treasury (2011) *The Magenta Book: Guidance for evaluation*
- HM Treasury (2018) *The Green Book: Central Government Guidance on Appraisal and Evaluation*
- Homes and Communities Agency (2014) *Additionality Guide (4th Edition)*
- Humber Local Enterprise Partnership (2014) *Humber Strategic Economic Plan 2014-2020*
- Humber Local Enterprise Partnership (2018) *The Humber's Blueprint for an Industrial Strategy*
- Ministry for Housing, Communities and Local Government (2019) *National Planning Policy Framework*
- North East Lincolnshire Council (2016) *North East Lincolnshire Economic Strategy*
- North East Lincolnshire Council (2018) *North East Lincolnshire Local Plan 2013 – 2032*
- Office for National Statistics (2018) *Business Register and Employment Survey*
- Office for National Statistics (via NOMIS, accessed October 2019)

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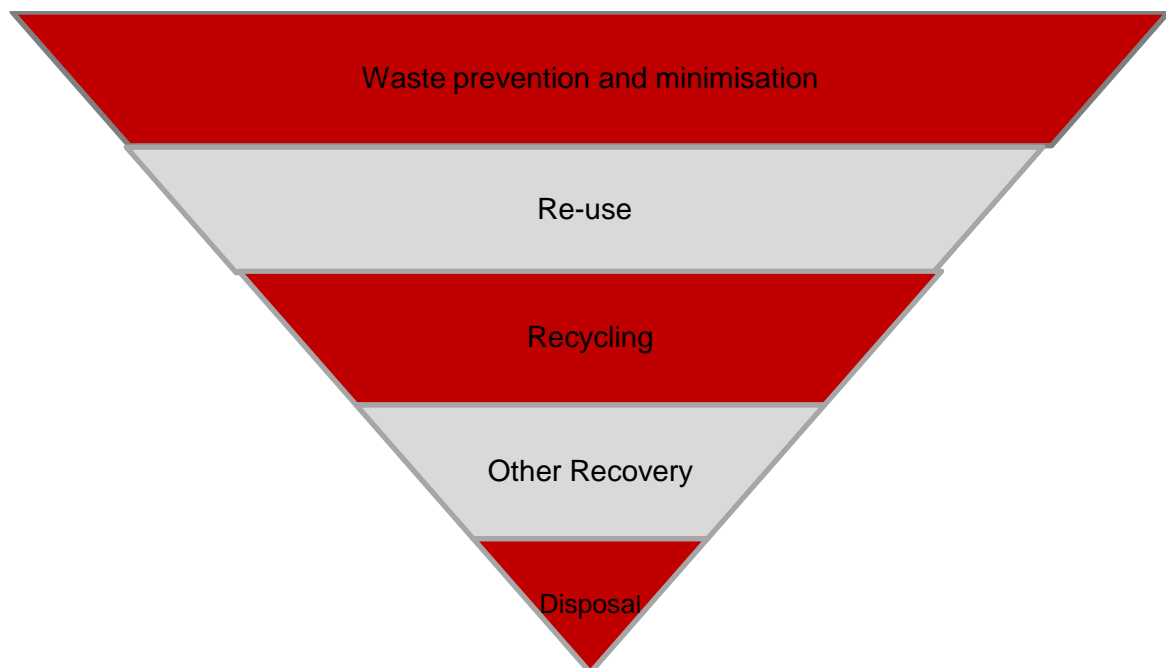
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16.0 WASTE MANAGEMENT

16.1 Introduction

- 16.1.1 This chapter addresses the potential effects of the Proposed Development on waste management.
- 16.1.2 Waste is defined as per the Waste Framework Directive (2008/98/EC) (Official Journal of the European Union, 2008) (WFD) 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.
- 16.1.3 During construction, operation (including maintenance) and decommissioning of the Proposed Development, the aim is to prioritise waste prevention, followed by re-use, recycling, recovery and lastly disposal to landfill as per the internationally recognised waste hierarchy (see Plate 16.1).

Plate 16.1: Waste hierarchy



- 16.1.4 There is potential for quantities of waste to be generated during the construction of the Proposed Development, in particular if the contractor determines that the top layer of ground within the Main Development Area is to be cut and filled to improve geotechnical conditions for construction (as outlined in Chapter 5: Construction Programme and Management).
- 16.1.5 Waste will also be generated during the operation and maintenance of the Proposed Development, predominantly from combustion and flue gas treatment.

16.2 Legislation and Planning Policy Context

- 16.2.1 Relevant policies, legislation and guidance have been considered as part of the waste assessment, which have informed the identification of receptors and resources and their sensitivity, the assessment methodology, the potential for significant environmental effects, and required mitigation.

National Legislation and Policy

Overarching National Policy Statement for Energy (EN-1)

- 16.2.2 The Overarching National Policy Statement for Energy (EN-1) (Department of Energy and Climate Change, 2011a) states that, in determining a Development Consent Order application for energy infrastructure, the decision-maker should:

“consider the extent to which the applicant has proposed an effective system for managing hazardous and non-hazardous waste arising from the construction, operation and decommissioning of the proposed development. It should be satisfied that:

- any such waste will be properly managed, both on-site and off-site;*
- the waste from the proposed facility can be dealt with appropriately by the waste infrastructure which is, or is likely to be, available. Such waste arisings should not have an adverse effect on the capacity of existing waste management facilities to deal with other waste arisings in the area; and*
- adequate steps have been taken to minimise the volume of waste arisings, and of the volume of waste arisings sent to disposal, except where that is the best overall environmental outcome.”*

National Policy Statement for Renewable Energy Infrastructure (EN-3)

- 16.2.3 The National Policy Statement for Renewable Energy Infrastructure (EN-3) (Department for Energy and Climate Change, 2011b) states that, with respect to waste generated by biomass or waste energy generation projects:

- “The assessment should include the production and disposal of residues as part of the ES. Any proposals for recovery of ash and mitigation measures should be described”; and*
- “Applicants should set out the consideration they have given to the existence of accessible capacity in waste management sites for dealing with residues for the planned life of the power station.”*

The Waste Management Plan for England (2013)

- 16.2.4 The Waste Management Plan for England (Department for Environment, Food and Rural Affairs (Defra), 2013) fulfils the WFD Article 28 mandatory requirements, and other required content as set out in Schedule 1 to the Waste (England and Wales) Regulations 2011. The Waste Management Plan is a high level document, which outlines waste that is generated and how those materials are managed. The Waste Management Plan provides an analysis of current waste management practices in England, and evaluates implementation of the objectives and provisions of the revised WFD. In terms of demolition and construction waste, the plan details how the United Kingdom is committed to meeting its target under the WFD of recovering at least 70% by weight, of construction and demolition waste by 2020.

The National Planning Policy for Waste (2014)

- 16.2.5 The National Planning Policy for Waste (Department for Communities and Local Government, 2014) provides the planning framework to enable Local Authorities to put forward, through local waste management plans, strategies that identify sites and areas suitable for new or enhanced facilities to meet the waste management needs of their areas. Information is also included concerning non-waste developments, including any development whose end function is not directly related to waste. Waste developments include landfills, waste disposal, waste treatment, waste recycling plants, and Household Waste Recycling Centres.

Local Policy

16.2.6 The waste disposal authority for the Site is North East Lincolnshire Council. The Council's Local Plan 2013 to 2032 (adopted 2018) includes policies relating to waste management. Policy 47 includes the statement that:

"The Council will also seek to secure the recycling of Construction, Demolition and Excavation (CD&E) waste at the locations where waste is produced, including the temporary provision for recovery, separation and where appropriate processing of on-site materials."

16.2.7 The above mentioned plans and policies have informed the assessment methodology.

16.2.8 The assessment has also taken account of the key legislation relevant to waste management for the Proposed Development, including, but not limited to:

- The Waste (England and Wales) Regulations 2011;
- The Environmental Permitting (England and Wales) Regulations 2016;
- Environmental Protection Act 1990;
- Hazardous Waste (England and Wales) Regulations 2005; and
- Waste Framework Directive 2008/98/EC.

16.3 Assessment Methodology and Significance Criteria

Assessment Scope

16.3.1 Waste management has been scoped into the Environmental Impact Assessment (EIA) primarily because (as described in Chapter 5: Construction Programme and Management) there may be a requirement to cut and fill the top layer of ground within the Main Development Area to improve geotechnical conditions for construction, which could generate a large volume (approximately 160,000 m³) of surplus excavation material.

16.3.2 The Study Area for the waste assessment has been defined as the Yorkshire and Humber region.

Construction

16.3.3 Waste will be generated during construction. The majority of construction waste types will be generated in small quantities, and a large proportion of these would be recycled, with the remainder disposed off-site by a licensed waste contractor.

16.3.4 The quantities of waste generated during construction of the Proposed Development have been estimated using the Smartwaste waste benchmark data (Building Research Establishment, 2012) for industrial buildings, which are available based on either construction spend, or building floor area.

Table 16.1: Waste benchmarks

	AVERAGE M³/ 100 M²	AVERAGE M³/ £100K
Industrial buildings	13.0	10.8

16.3.5 The benchmark value for m³ of waste per 100 m² of floor area has been used for this assessment and is considered to represent a realistic worst-case estimate. Using the benchmark value based on project cost would give a misleadingly high estimate, since a large proportion of the capital cost of the project relates to the power generation and associated plant, which is manufactured off Site and is unlikely to generate significant quantities of on Site construction waste.

16.3.6 Surplus excavated materials may arise if geotechnical ground improvement works are identified as being necessary by the appointed construction contractor following ground investigation and detailed design. This could require the removal of c. 2 m depth of ground from the Main Development Area to be replaced with engineering fill material.

16.3.7 This assessment considers the cut and fill of the entire Main Development Area, as a worst case.

Operation

16.3.8 As described in Chapter 4: The Proposed Development, operational waste will predominantly comprise combustion residues (bottom ash) and flue gas treatment (FGT) residues, which will be managed in accordance with the relevant environmental regulations using licensed waste contractors. The estimated volumes and waste management methods for these operational wastes are considered in this assessment.

16.3.9 Aside from foul water from domestic facilities (kitchens, toilets etc) at the Proposed Development, under normal plant operation liquid waste volumes will be minimal and will be returned to the operational process for re-use. Any excess liquid effluent would be stored on site and tankered off by a suitable contractor, or discharged to Anglian Water foul sewer under a trade effluent consent. Liquid effluent is therefore not considered further in this chapter.

16.3.10 Waste from maintenance activities would be of significantly lower volumes than those generated from normal plant operation and therefore are not assessed further in this chapter.

Decommissioning

16.3.11 Waste generated during decommissioning and demolition of the Proposed Development has been scoped out of this assessment because:

- there is no information on waste policies, regional waste arisings or facilities that may be in place when the Proposed Development is decommissioned (2053 or later), hence it is not possible to define a baseline;
- any future decommissioning contractor will be required to comply with relevant legislation and policy at that time;
- the majority of materials generated during future decommissioning will comprise concrete and steel, both of which are likely to be recycled rather than disposed; and
- there is no certainty on the timing or method of decommissioning, hence it is not possible to determine the quantities or types of waste that may be generated.

Assessment Scenarios and Parameters

16.3.12 As described in Chapter 4: The Proposed Development and Chapter 5: Construction Programme and Management, three possible construction programme scenarios have been identified. As there is no difference in the scale and duration of construction for all three scenarios, the total waste that would be generated by any construction scenario would be the same. However it is noted that in Scenario 1 (the most likely scenario as described in Chapter 5: Construction Programme and Management, whereby the additional elements required for the Proposed Development are constructed part way through the construction of the Consented Development) the Proposed Development would not generate any significant additional waste beyond that already generated by the construction of the Consented Development. This is assessed in paragraphs 16.6.12 to 16.6.19.

16.3.13 For the operational scenario, the quantities of waste presented in the assessment are based on the maximum parameters (Rochdale envelope) for the Proposed Development, which represents the worst case for the operational assessment.

Consultation

16.3.14 Comments in relation to the waste management assessment within the EIA Scoping Opinion received from the Planning Inspectorate (PINS) on 2nd October 2019 have been reviewed.

16.3.15 The comments state “the assessment in the ES must be structured in the way described in Section 6.3 of the Scoping Report. The study area and impacts assessed must be clearly explained and justified.”

16.3.16 Public Health England’s comments on the EIA scope dated 18th September 2019 (included within Annex 2 of the EIA Scoping Opinion) are also noted:

“The applicant should demonstrate compliance with the waste hierarchy (e.g. with respect to re-use, recycling or recovery and disposal). For wastes arising from the development the ES should assess:

- *the implications and wider environmental and public health impacts of different waste disposal options;*
- *disposal route(s) and transport method(s) and how potential impacts on public health will be mitigated.*

If the development includes wastes delivered to the installation:

- *consider issues associated with waste delivery and acceptance procedures (including delivery of prohibited wastes) and should assess potential off-site impacts and describe their mitigation.”*

16.3.17 The consultation response by NELC to PINS explained that the EIA Scoping Report captured the relevant information requested by NELC in the scoping opinion in respect of the Consented Development and that NELC have no further comments.

16.3.18 As set out in Section 16.5 below, all wastes arising from the Proposed Development will be managed appropriately in accordance with the waste hierarchy, relevant legislation and best practice. Waste disposal sites are regulated by Environmental Permits, and their operation is outside the scope of this assessment.

Significance of Effects

16.3.19 Waste management effects and their significance during construction have been assessed by:

- establishing the baseline for inert landfill capacity in Yorkshire and the Humber planning region;
- estimating the likely quantity of surplus excavated materials that will be generated by the Proposed Development; and
- comparing the quantity of surplus excavated materials from the Proposed Development to the baseline inert landfill capacity and assessing the likely impact on that capacity and ability of these sites to accept the waste.

16.3.20 Waste management effects and their significance during operation have been assessed by:

- establishing the current annual baseline for inert waste arisings in Yorkshire and the Humber planning region, and for hazardous waste arisings nationally (recognising that non-hazardous wastes are typically managed regionally, whereas hazardous wastes are often managed nationally, using a much smaller network of facilities);
- estimating the likely quantity of bottom ash and FGT residues that will be generated by the Proposed Development; and
- comparing the quantity of operational waste from the Proposed Development to the current annual baseline arisings of these wastes.

16.3.21 In the absence of other guidance on assessing the effects of developments on waste management arisings, the significance criteria used within this assessment have been derived from previous AECOM experience and on the basis of professional judgment.

16.3.22 The significance of waste management effects has been determined using the criteria set out in Table 16.2. This methodology for classification of effects is different to the standard methodology set out in Chapter 2: Assessment Methodology, but given the nature of this assessment (whereby receptor sensitivity does not form part of the assessment), this is considered to be appropriate.

Table 16.2: Waste management assessment criteria and classification of effects

EFFECT	CRITERIA FOR EFFECTS OF WASTE GENERATED (CONSTRUCTION)	CRITERIA FOR EFFECTS OF WASTE GENERATED (OPERATION)	SIGNIFICANCE
Negligible	Negligible increase in waste arisings less than 0.1% of current available disposal capacity; causing insignificant burden to the local and regional waste management infrastructure.	Negligible increase in waste arisings less than 0.1% of current annual waste arisings in the region (for inert waste) and nationally (for hazardous waste).	Not significant
Minor	Minor increase in waste arisings between 0.1% and 1.9% of current available disposal capacity; causing a minor burden to the local and regional waste management infrastructure.	Minor increase in waste arisings between 0.1% and 1.9% of current annual waste arisings in the region (for inert waste) and nationally (for hazardous waste).	Not significant
Moderate	Moderate increase in waste arisings between 2% and 5% of current available disposal capacity; potentially causing moderate burden to the local and regional waste management infrastructure.	Moderate increase in waste arisings between 2% and 5% of current annual waste arisings in the region (for inert waste) and nationally (for hazardous waste).	Significant

EFFECT	CRITERIA FOR EFFECTS OF WASTE GENERATED (CONSTRUCTION)	CRITERIA FOR EFFECTS OF WASTE GENERATED (OPERATION)	SIGNIFICANCE
Major	Large increase in waste arisings greater than 5% of current available disposal capacity; potentially causing significant burden to the local and regional waste management infrastructure.	Large increase in waste arisings greater than 5% of current annual waste arisings in the region (for inert waste) and nationally (for hazardous waste).	Significant

16.3.23 In line with the assessment methodology outlined in Chapter 2: Assessment Methodology in PEIR Volume I, only moderate and major effects are considered to be significant for the purposes of the EIA.

16.4 Baseline Conditions

Existing Baseline

16.4.1 The Environment Agency's Waste Management Information 2018 (published in 2019) includes the following information about waste sent to landfills in 2018 and remaining landfill capacity in the former Humberside area, and in the wider Yorkshire and the Humber region, as shown in Table 16.3 and Table 16.4.

Table 16.3: Yorkshire and the Humber landfill inputs 2018 (000 tonnes)

LANDFILL TYPE	SUB-REGION				YORKSHIRE AND THE HUMBER
	FORMER HUMBER -SIDE	NORTH YORK-SHIRE	SOUTH YORK-SHIRE	WEST YORK-SHIRE	
Hazardous Merchant	25	-	-	71	96
Hazardous Restricted	-	-	-	-	-
Non Hazardous with SNRHW cell	8	-	-	536	543
Non Hazardous	857	241	254	936	2,288
Non Hazardous Restricted	18	256	12	-	285
Inert	428	201	80	251	959
Total	1,334	699	345	1,794	4,171

*SNRHW –Stable Non-Reactive Hazardous Waste

Table 16.4: Yorkshire and the Humber landfill capacity 2018 (000 cubic metres)

LANDFILL TYPE	SUB-REGION				YORKSHIRE AND THE HUMBER
	FORMER HUMBER-SIDE	NORTH YORK-SHIRE	SOUTH YORK-SHIRE	WEST YORK-SHIRE	
Hazardous merchant	837	-	-	1,815	2,652
Hazardous Restricted	-	-	-	-	-
Non Hazardous with SNRHW cell*	1,243	-	-	-	1,243
Non Hazardous	26,043	17,003	3,926	6,822	53,793
Non Hazardous Restricted	-	-	-	-	-
Inert	2,992	986	6,491	2,970	13,439
Total	31,115	17,988	10,417	11,607	71,128

- 16.4.2 Data on regional waste generation (see Table 16.5) is available in the 'Yorkshire and Humber Waste Position Statement February 2016' which was produced jointly by all seventeen Waste Planning Authorities in the Yorkshire and Humber area to help ensure appropriate coordination in planning for waste.

Table 16.5: Estimated annual waste arisings in Yorkshire and the Humber

WASTE STREAM	ESTIMATED ARISINGS (000 TONNES)
Local Authority Collected Waste (LACW)	2,490
Commercial and Industrial waste (C&I)	6,944
C&I minus power and utilities	4,880
Construction, demolition and excavation waste (CD&E)	10,497
Hazardous waste	522

- 16.4.3 According to the 'Digest of Waste and Resource Statistics – 2018 Edition' (Defra, 2018), the UK generated 4.3 million tonnes of hazardous waste in 2014, the latest date for which data is presented.

Future Baseline

- 16.4.4 The Environment Agency does not publish information on future landfill capacity and it is therefore not possible to accurately establish a future baseline. Whilst existing capacity will be utilised, new capacity is expected to be developed in order to accommodate future flows of waste requiring disposal. For the purposes of this assessment, it is therefore assumed that the future baseline landfill capacity will be similar to the current baseline capacity. Similarly, there is insufficient information to estimate future levels of waste

arising in the region, and hence the future annual baseline waste arisings are assumed to be similar to the current baseline arisings.

- 16.4.5 If the Consented Development is progressed, construction and operational wastes would be generated in the same volumes and types of wastes as set out in Section 16.6 of this Chapter in relation to the Proposed Development.

16.5 Development Design and Impact Avoidance

Construction

- 16.5.1 Waste arisings will be prevented and designed out where practicable through working with suppliers to minimise wastage in materials and packaging.
- 16.5.2 Contractors will be required to adopt good practice in construction waste management which will reduce the quantity of waste generated. The following approaches will be implemented, where practicable, in order to minimise the quantities of waste requiring disposal:
- agreements with material suppliers to reduce the amount of packaging or to participate in a packaging take-back scheme;
 - implementation of a 'just-in-time' material delivery system to avoid materials being stockpiled, which increases the risk of their damage and disposal as waste;
 - attention to material quantity requirements to avoid over-ordering and generation of waste materials;
 - re-use of materials wherever feasible, e.g. re-use of excavated soil for landscaping. Concrete will be either taken off Site for crushing and re-use, or crushed and re-used on Site;
 - segregation of waste at source where practical; and
 - re-use and recycling of materials off Site where re-use on Site is not practical (e.g. through use of an off Site waste segregation facility and re-sale for direct re-use or re-processing).
- 16.5.3 The following waste management measures will be implemented in order to minimise the likelihood of any localised impacts of waste on the surrounding environment:
- damping down of surfaces during spells of dry weather and brushing/ water spraying of heavily used hard surfaces/ access points across the Site as required;
 - off Site prefabrication, where practical, including the use of prefabricated structural elements, cladding units, toilets, mechanical and electrical risers and packaged plant rooms;
 - open burning of waste or unwanted materials will not be permitted on Site;
 - all hazardous materials including fuels, chemicals, cleaning agents, solvents and solvent containing products to be properly sealed in sealed containers at the end of each day prior to storage in appropriately protected and bunded storage areas;
 - any waste effluent will be tested and where necessary, disposed of at the correctly licensed facility by a licensed specialist contractor(s); and
 - materials requiring removal from the Site will be transported using licensed carriers and records will be kept detailing the types and quantities of waste moved, and the destinations of this waste, in accordance with the relevant regulations.

- 16.5.4 A framework Construction Environmental Management Plan (CEMP) has been prepared and is presented within Appendix 5A in PEI Report Volume III. This will be finalised by the contractor prior to the start of construction. The CEMP will set out how waste will be managed during construction, and opportunities to re-use and recycle waste will be explored in accordance with the waste hierarchy.

Operation

- 16.5.5 The Environmental Management System that will be developed and maintained for the operational Proposed Development as required by the Environmental Permit will include procedures for the management of waste in accordance with relevant legislation.

16.6 Likely Impacts and Effects

The Proposed Development

- 16.6.1 The impacts and effects of the Proposed Development compared to a future baseline without the Consented Development are described below.

Construction

- 16.6.2 Based on the indicative concept layout, the total footprint for all structures is anticipated to be around 26,600 m².
- 16.6.3 Using this footprint area and the benchmark data for waste generation (see Table 16.1), the total estimated waste arisings are 3,458 m³, equivalent to 5,099 tonnes.
- 16.6.4 It is not possible at this stage to accurately estimate the quantities of different wastes that will be generated. Provisional estimates have been made based on average composition data for construction waste from new-build industrial buildings published by WRAP (WRAP, 2009), and are shown in Table 16.6 below. These estimates relate to the quantities of waste generated, and not the quantities of waste requiring landfill disposal. It is expected that a significant proportion of the waste may be suitable for re-use or recycling.

Table 16.6: Estimated construction waste types and tonnages for the Proposed Development

WASTE TYPE	AVERAGE PERCENTAGE COMPOSITION	ESTIMATED TONNES
Bricks	10%	488
Tiles and ceramics	0%	4
Concrete	44%	2,253
Inert	26%	1,329
Insulation	0%	19
Metals	3%	131
Packaging	2%	92
Gypsum	1%	51
Binders	0%	2
Plastics	0%	15
Timber	2%	107
Floor coverings (soft)	0%	1
Electrical and electronic equipment	0%	0
Furniture	0%	1
Canteen/ office/ ad hoc	1%	29
Liquids	0%	-
Oils	0%	-
Asphalt and tar	2%	113
Hazardous	1%	36
Other	0%	-
Mixed	8%	425
TOTAL	100%	5,099

- 16.6.5 A Site specific ground investigation is being carried out and the results will be included within the final ES for the Proposed Development. At this stage, it is assumed that approximately 2 m depth of soil across the Main Development Area will be removed and replaced with engineering fill, to improve geotechnical conditions at the Site. Based on the topographical data available it is estimated this activity will generate approximately 160,000 m³ of surplus excavated material that will require exporting from Site. In addition, an estimated 3,458 m³ of other construction waste may be generated during the construction phase, as described above.
- 16.6.6 Although it may be possible to re-use some of this material on Site, or to find beneficial off Site uses, the worst-case assumption is that this material will be disposed of to a landfill site.
- 16.6.7 Environment Agency data presented in Table 16.4 shows that there is approximately 13.5 million m³ of inert waste landfill capacity in the Yorkshire and the Humber region. The surplus excavated material and other construction waste generated by the site comprises approximately 1.2% of this available capacity and is therefore considered to be a minor adverse effect, and not significant.

Operation

16.6.8 The following quantities of operational process waste are anticipated:

- up to 179,000 tonnes per annum of bottom ash, which will either be landfilled or recycled as a secondary aggregate; and
- approximately 20,600 tonnes per annum of FGT residues, which will be disposed of as hazardous waste (due to their alkaline nature).

16.6.9 Bottom ash from energy from waste facilities is widely recycled in the UK, for use as a secondary aggregate. However, as a worst case, it is assumed that bottom ash may be disposed of to landfill.

16.6.10 Since bottom ash more closely resembles construction and demolition waste than commercial/ industrial waste (being an inert material), the arisings of bottom ash from the Proposed Development are compared to the annual arisings of construction, demolition and excavation waste in Yorkshire and the Humber, which is approximately 10.5 million tonnes per year (see Table 16.5). The estimated annual quantity of bottom ash generated will therefore represent approximately 1.7% of Yorkshire and the Humber's annual construction, demolition and excavation waste arisings, and hence is assessed as a minor adverse effect, and not significant.

16.6.11 FGT residues will be disposed of to a hazardous waste landfill. The estimated annual quantity of FGT residues generated would represent approximately 0.48% of the UK's annual hazardous waste arisings (see Table 16.5), and hence is assessed as a minor adverse effect, and not significant.

Comparison of Proposed Development and Consented Development

16.6.12 The impacts and effects of the Proposed Development compared to a future baseline with the Consented Development are described below.

Construction

16.6.13 The worst case assumption that the whole Main Development Area may require 2 m cut and fill for geotechnical purposes applies to both the Consented Development and the Proposed Development. The overall scale and nature of construction is also the same for both Consented and Proposed Developments. The Proposed Development would have no significant additional construction waste impacts compared to the Consented Development.

16.6.14 The same methods for managing waste during construction (as set out in Section 16.5 above) would be applied for either the Consented Development or the Proposed Development.

16.6.15 The percentage (%) contribution of waste from the Proposed Development to the total regional waste arisings of around 13.5 million m³ of inert waste landfill capacity in the Yorkshire and Humber region is estimated to be 1.2%. The % contribution reported for the Consented Development was 1.1% but this is only the result of updated baseline data used for the assessment (the actual volume and type of waste is the same). The Proposed Development would therefore have no additional construction waste effects compared to the Consented Development.

Operation

16.6.16 The quantities and types of operational waste would be the same for the Proposed Development as for the Consented Development.

16.6.17 The estimated annual quantity of bottom ash generated for the Proposed Development represents approximately 1.7% of Yorkshire and the Humber's annual construction,

demolition and excavation waste arisings, which is the same as previously estimated for the Consented Development.

- 16.6.18 As such, the operation of the Proposed Development is predicted to have no additional operational waste effect compared to a future baseline with the operation of the Consented Development.

Decommissioning

- 16.6.19 The nature and scale of decommissioning activities would be the same for the Proposed Development as for the Consented Development, so the decommissioning of the Proposed Development is predicted to have no additional waste effect compared to a future baseline with the decommissioning of the Consented Development.

16.7 Mitigation and Enhancement Measures

Construction

- 16.7.1 No further mitigation measures for waste management are required for the Proposed Development other than those identified in Section 16.5 Development Design and Impact Avoidance.
- 16.7.2 During the detailed design stage, the construction contractor will seek to minimise the quantities of surplus excavated materials where practicable.
- 16.7.3 Prior to and during construction, the contractor will seek to identify beneficial uses for surplus excavated material both within the Site and on other sites, and landfill disposal will be used only as the final option, in accordance with the waste hierarchy.

Operation

- 16.7.4 The operator will explore opportunities for the beneficial re-use of bottom ash as a secondary aggregate to avoid landfill if possible, in accordance with the waste hierarchy.

16.8 Limitations or Difficulties

- 16.8.1 There are no significant limitations or difficulties associated with this topic. In the absence of the ground investigation information, estimates of construction waste arisings have been based on a worst case scenario as noted above. This will be reviewed when available and any updates required presented within the future ES for the Proposed Development. This use of the worst case scenario approach has enabled a robust assessment to be carried out at this stage.

16.9 Residual Effects and Conclusions

- 16.9.1 The potential need to dispose of surplus excavated material to an inert waste landfill has been assessed and no significant residual effects with respect to waste management are anticipated for the Proposed Development.
- 16.9.2 The potential impacts of managing operational waste have been assessed and no significant residual effects with respect to waste management are anticipated for the Proposed Development.
- 16.9.3 The Proposed Development would have no additional waste effects compared to the Consented Development.

16.10 References

Department for Communities and Local Government (2014) *National Planning Policy for Waste*

Department for Communities and Local Government (2018) *National Planning Policy Framework*

Department of Energy and Climate Change (2011a) *Overarching National Policy Statement for Energy (EN-1)*

Department of Energy and Climate Change (2011b) *National Policy Statement for Renewable Energy Infrastructure (EN-3)*

Department for Environmental Food and Rural Affairs (2013) *Waste Management Plan for England*

Environment Agency (2019) *Waste Management for England 2019*

North East Lincolnshire Council (2018) *North East Lincolnshire Council Local Plan 2013 to 2032 (Adopted 2018)*

Yorkshire and Humber Waste Planning Authorities (2016) *Yorkshire and Humber Waste Position Statement*

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17.0 CUMULATIVE AND COMBINED EFFECTS

17.1 Introduction

17.1.1 This Chapter of the Preliminary Environmental Information (PEI) Report provides an assessment of the potential for cumulative and combined effects to occur as a result of the Proposed Development. Cumulative and combined effects are defined as follows:

- cumulative effects are those that accrue over time and space from a number of development activities – the impact of the Proposed Development is considered in conjunction with the potential impacts from other projects or activities which are both reasonably foreseeable in terms of delivery (i.e. have planning consent or relevant applications which have been submitted and are in the planning system) and are located within a realistic geographical scope where environmental impacts could act together with the Proposed Development to create a more significant overall effect; and
- combined effects are those resulting from a single development (the Proposed Development) on any one receptor that may collectively cause a greater effect (such as the combined effects of noise and visual disturbance impacts during construction on birds).

17.1.2 The assessment presented in this Chapter draws on the assessment of impacts provided in Chapters 7 to 16 of this PEI Report, and information in the public domain relating to other known developments within the Study Area.

17.1.3 The cumulative impact assessment does not consider other developments that are already constructed and operating, as such existing developments are already accounted for in the baseline conditions established for the main assessments within Chapters 7 to 16 of this PEI Report.

17.1.4 As described earlier in this PEI Report, full planning permission for a 49.9 MW energy from waste power station at the Site was granted under the Town and Country Planning Act 1990 on 12th April 2019 (referred to as 'the Consented Development'). Since the grant of this planning permission ('the Planning Permission') the Applicant has been assessing potential opportunities to improve the efficiency of the Consented Development and now proposes an energy from waste power station of up to 95 MW electrical output (the Proposed Development). Cumulative effects of the Proposed Development and Consented Development are not relevant to the cumulative impact assessment because only one or the other could occur.

17.1.5 This Chapter is supported by Figure 17.1 in PEI Report Volume II.

17.2 Legislation and Planning Policy Context

17.2.1 The requirement for cumulative and combined impact assessments is stated in the relevant European Directive and domestic legislation, as detailed below:

- European Directive 2014/52/EU on the assessments of effects of certain public and private projects on the environment requires an assessment of "*the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium term and long-term, permanent and temporary, positive and negative effects of the project*";
- Schedule 4 Part 5 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 ('the EIA Regulations') requires: "*A description of the likely significant effects of the development on the environment resulting from, inter alia [...] (e) the cumulation of effects with other existing and/or approved projects, taking*

into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources". The EIA Regulations state that this description of likely significant effects "should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development";

- paragraph 4.1.3 of the Overarching National Policy Statement (NPS) for Energy (EN-1) (Department for Energy and Climate Change, 2011) states that:

"In considering any proposed development, and in particular when weighing its adverse impacts against its benefits, the IPC should take into account:

- *its potential benefits including its contribution to meeting the need for energy infrastructure, job creation and any long-term or wider benefits; and*
- *its potential adverse impacts, including any long-term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts."*
- paragraph 4.2.5 of NPS EN-1 goes on to state that when considering cumulative effects, *"the ES should provide information on how the effects of the applicant's proposal would combine and interact with the effects of other development (including projects for which consent has been sought or granted, as well as those already in existence) [...]"*; and
- paragraph 4.2.6 of NPS EN-1 states that consideration should be given to *"how the accumulation of, and interrelationship between, effects might affect the environment, economy or community as a whole, even though they may be acceptable when considered on an individual basis with mitigation measures in place may also have other evidence before it, for example from appraisals of sustainability of relevant NPSs or development plans, on such effects and potential interactions"*.
- paragraph 107 of the Planning Act 2008: Guidance on the pre-application process (Department for Communities and Local Government, 2015) states that:

"Applicants should consider the potential cumulative impacts on an area as a result of increasing development in the proposed area, as well as those developments which are:

 - *in the process of being built;*
 - *permitted application(s), but not yet implemented;*
 - *submitted application(s) not yet determined;*
 - *projects on the National Infrastructure's programme of projects;*
 - *identified in the relevant Local Plan (and emerging Local Plans -with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited, and*
 - *identified in other plans and programmes (as appropriate) which set*
 - *the framework for future development consents/approvals, where*
 - *such development is reasonably likely to come forward.*
- Paragraph 108 of the Guidance (Department for Communities and Local Government, 2015) states *"It may not always be easy for applicants to assess potential impacts fully due to lack of available information. In such circumstances,*

applicants should take a pragmatic approach when determining what is feasible and reasonable. They should satisfy themselves that they have made all reasonable efforts to identify the main impacts and to include mitigation measures in their draft Order. As with the parameters for the Rochdale Envelope, applicants should fully explain their options to the Secretary of State as part of their application. National Policy Statements provide a useful overview of common impacts and ways of mitigating them”.

17.3 Assessment Methodology

Impact Assessment and Significance Criteria

- 17.3.1 This assessment aims to identify the potential for cumulative and combined effects expected to occur during the construction and operation (including maintenance) of the Proposed Development, and where possible, identify the possibility for significant effects.
- 17.3.2 Construction effects are assessed assuming construction of the Proposed Development starts construction in 2020; as this is the worst case because it is likely that more of the other developments identified for assessment are expected to be constructed in this period.
- 17.3.3 The cumulative operational assessment considers the total effects of the Proposed Development and the other identified developments operating concurrently.
- 17.3.4 Cumulative effects during decommissioning of the Proposed Development are not considered as there is no defined time at which decommissioning will take place and therefore no certainty of temporal overlap with other identified developments.
- 17.3.5 There is no standard prescriptive method for assessing cumulative and combined effects and, in relation to cumulative effects, the extent to which the effects of other developments can be assessed quantitatively depends on the level of information available about the other developments. Such effects are, therefore, assessed by professional judgment, although matrices and modelling are used where appropriate and where enough information regarding the other developments exists. Where environmental assessment information regarding other developments is not available or uncertain, the assessment is necessarily qualitative.

Cumulative Effects Assessment Methodology

- 17.3.6 Whilst not a prescribed or statutory process, the Planning Inspectorate (PINS) Advice Note 17 ‘Cumulative effects assessment relevant to nationally significant infrastructure projects’ (PINS, 2019) sets out a staged process which applicants may wish to follow when undertaking cumulative impact assessments for Development Consent Order applications. This sequential process is categorised in four stages:
- Stage 1: Establishing the long list;
 - Stage 2: Establishing the short list;
 - Stage 3: Information gathering; and
 - Stage 4: Assessment.
- 17.3.7 This approach has been followed in undertaking the cumulative effects assessment for the Proposed Development. The other developments considered in this Chapter are either:
- approved projects (not yet constructed or operational); or
 - projects submitted but not yet approved.

- 17.3.8 The final ES will also consider cumulative effects with development identified on relevant plans and programmes (i.e. identified on Local Plans), although it is noted that the available information on the environmental effects of the development of allocated land is expected to be very limited.
- 17.3.9 In determining the possible significance of cumulative effects, the location and timing of the identified other developments and their associated impacts/ effects have been taken into account wherever possible.
- 17.3.10 The cumulative effects assessment only considers those receptors that would experience a residual effect associated with the Proposed Development. For receptors where the Proposed Development's residual effects are deemed to be neutral/ negligible as reported in this PEI Report, it is considered that such receptors could not experience cumulative effects.
- 17.3.11 A long list of other developments in the vicinity of the Proposed Development was identified following a search of the relevant planning databases (PINS, NELC, North Lincolnshire Council (NLC) and East Riding of Yorkshire Council (ERYC)). From this long list a refined short list of other developments was prepared that were considered to be of relevance to the cumulative effects assessment given the nature of the Proposed Development and the potential effects.
- 17.3.12 Following information gathering from available sources, the effects of the Proposed Development have been considered by each technical discipline in conjunction with the potential effects from the developments included in the short list where there is potential that environmental impacts could act together to create an effect that is more (or less) significant overall than the effect of the individual developments alone.
- 17.3.13 In assessing cumulative effects it is important to acknowledge the relative contributions the different developments make to a cumulative effect and to consider whether a cumulative effect could occur at all.

Study Area

- 17.3.14 Cumulative effects are generally unlikely to arise unless the other development sites are in close proximity to the Proposed Development, recognising that actual distance varies with the nature of the potential effect and the nature of the receptor, e.g. cumulative air quality effects could occur for developments a greater distance apart than noise effects. Construction projects are, as a matter of routine, required to employ regulatory and managerial controls and follow best practice to mitigate construction impacts wherever possible. Nevertheless, consideration has been given to the presence of common pathways from nearby developments to a single receptor, and whether there is potential for impacts of a sufficient magnitude whereby a particular receptor could experience cumulative effects.
- 17.3.15 The study area for the consideration of cumulative and combined effects has been developed taking into account the predicted extent of impacts associated with the Proposed Development, and the point at which the associated effects become insufficient to contribute in any meaningful way to those of another development.
- 17.3.16 Information on the likely extent of impacts associated with other developments in the area has also been considered when determining the long and short list of other developments to be considered.
- 17.3.17 The study area for each environmental assessment topic is defined in the relevant PEI Report technical chapters (Chapters 7 to 16). A summary of each environmental topic and its ZOI is included below within Table 17.1.

Table 17.1: Zone of Influence summary table

ENVIRONMENTAL TOPIC	ZONE OF INFLUENCE
Air Quality	<p>Construction dust (human health receptors): 350 m from Site boundary and 50 m from construction traffic route (up to 500 m from Site entrances).</p> <p>Construction dust (ecological receptors): 50 m from Site boundary and/ or construction traffic route (up to 500 m from Site entrances).</p> <p>Operational point-source emissions: 10 km.</p> <p>Traffic air quality: as per Zol for Traffic and Transport assessment, as described below.</p> <p>Refer to Chapter 7: Air Quality for more information.</p>
Noise and Vibration	<p>Construction and Operation noise and vibration from Site: 1 km (this is presented as an appropriate indicative Zol; as the assessment is based on individual receptors).</p> <p>Traffic noise: as per Zol for Traffic and Transport assessment, as described below.</p> <p>Refer to Chapter 8: Noise and Vibration for more information.</p>
Traffic and Transport	<p>The Zol for traffic and transportation is made up of several individual areas of the local road network where a potential impact or constraint has been identified. For this reason, a 'linear' set distance from the Site cannot be provided, however, the six links within the transport assessment study area are detailed below:</p> <ul style="list-style-type: none"> • South Marsh Road (East of Hobson Way); • South Marsh Road (West of Hobson Way); • Hobson Way (North of South Marsh Road); • Kiln Lane (West of Hobson Way); • A1173 (West of North Moss Lane); and • A1173 (North of A180). <p>Refer to Chapter 9: Traffic and Transport for more information.</p>
Ecology and Nature Conservation	<p>Construction and Operation (international statutory designations): 10 km.</p> <p>Construction and Operation (other statutory designations): 2 km.</p> <p>Construction and Operation (notable habitats and protected/notable species): 1 km.</p> <p>Construction and Operation (ponds): 250 m.</p> <p>Refer to Chapter 10: Ecology and Nature Conservation for more information.</p>

ENVIRONMENTAL TOPIC	ZONE OF INFLUENCE
Landscape and Visual Amenity	Construction and Operation: 10 km Refer to Chapter 11: Landscape and Visual Amenity for more information.
Geology, Hydrogeology and Land Contamination	Construction and Operation: 500 m Refer to Chapter 12: Geology, Hydrogeology and Land Contamination for more information.
Cultural Heritage	Construction and Operation: 5 km Refer to Chapter 13: Cultural Heritage for more information.
Water Resources, Flood Risk and Drainage	Construction and Operation: 750 m (this is an appropriate indicative Zol as the assessment is based on individual receptors). The Zol for water resources, flood risk and drainage is related to several specific features within the vicinity of the Site: <ul style="list-style-type: none"> • Oldfleet Drain (watercourse) – 140 m to the South of the Site; • Middle Drain (Ordinary watercourse) – 340 m to the north of the Site; • Oldfleet Drain (fluvial flood defences) – 270 m to the south-west of the Site; • Humber Estuary (tidal flood defences) – 160 m to the east of the Site; and • Humber Estuary – 175 m to the east of the Site. Refer to Chapter 14: Water Resources, Flood Risk and Drainage for more information.
Socio-Economics	Construction and Operation: Zol covers the Grimsby Travel To Work Area (TTWA) (see Plate 15.2 in Chapter 15: Socio-Economics). Refer to Chapter 15: Socio-Economics for more information.
Waste Management	Construction and Operation: Zol covers the Yorkshire and Humber region. Refer to Chapter 16: Waste Management for more information.

17.3.18 As shown in Table 17.1 the largest study areas relate to the waste management and socio-economics assessments (Yorkshire and Humber region and Grimsby TTWA respectively).

17.3.19 The effects of waste generated from the Proposed Development on the regional capacity for waste management are at such a low level that no significant cumulative effects with other developments are anticipated, so the search for other developments to be considered by the cumulative effects assessment has not been extended this far.

17.3.20 The cumulative socio-economics effects are likely to be significantly beneficial and it is not considered appropriate or necessary to extend the search for other developments to be considered by the cumulative effects assessment to this extent.

17.3.21 The next largest study area (10 km), to inform the assessment of source-point air emissions on ecological and human receptors, has therefore defined the overall Zol within which the search for other developments has been undertaken to inform the cumulative effects assessment.

Consultation

17.3.22 The Secretary of State has provided comments on the scope of the cumulative assessment through the EIA Scoping process with PINS. Through this consultation process further developments were identified and have been included within this assessment where appropriate.

17.3.23 Table 17.2: below provides a summary of recent consultation regarding cumulative and combined effects as well as how this has been addressed by the Applicant.

Table 17.2: Consultation summary

CONSULTEE/ DATE	SUMMARY	ADDRESSED
Secretary of State October 2019 (Scoping Opinion)	<p>The ES should explain how impacts can interact over different geographical scales depending on different environmental conditions and the sensitivity of the receptor under consideration.</p> <p>The Scoping Report states that the cumulative effects of the extant planning permission and the Proposed Development will not be assessed. The assessment of the effects of the Proposed Development alone will encompass the effects from the extant planning permission. The Inspectorate agrees with this approach.</p>	<p>Topic-specific geographical scales are provided within this Chapter. In line with the guidance in Advice Note 17 (PINS, 2019), individual Zols for each topic have been defined.</p> <p>Chapters 7-16 include comparison of the effects of the Proposed Development to the effects of the Consented Development, and identify any additional effects that may arise due to the Proposed Development. However, it is noted that whilst construction may be undertaken partly in accordance with the Planning Permission, and partly under the Development Consent Order, operation will be in accordance with one or other consent as it would be impossible to operate both the Proposed Development and the Consented Development at the same time.</p>

CONSULTEE/ DATE	SUMMARY	ADDRESSED
	<p>The Applicant should have regard to the advice in the Inspectorate's Advice Note 17 Cumulative Effects Assessment, when determining which developments to include in the CEA.</p> <p>The CEA should be quantitative rather than qualitative where it is necessary to provide confidence in the findings on likely significant effects.</p>	<p>Advice Note 17 forms the basis for the approach to the cumulative effects assessment.</p> <p>A combination of quantitative and qualitative assessment is used to determine the presence or absence of any cumulative (or combined) effects. The professional judgment on this matter is dependent on the specialist topic.</p>
<p>Natural England October 2019 (Scoping Opinion)</p>	<p>It will be important for any assessment to consider the potential cumulative effects of this proposal, including all supporting infrastructure, with other similar proposals and a thorough assessment of the 'in combination' effects of the proposed development with any existing developments and current applications. A full consideration of the implications of the whole scheme should be included in the ES. All supporting infrastructure should be included within the assessment.</p> <p>The assessment should also include the cumulative effect of the development with other relevant existing or proposed developments in the area. In this context Natural England advises that the cumulative impact assessment should include other proposals currently at Scoping stage. Due to the overlapping timescale of their progress through the planning system, cumulative impact of the proposed development with those proposals currently at Scoping stage would be likely to be a material consideration at the time of determination of the planning</p>	<p>As described above Chapters 7-16 include comparison of the effects of the Proposed Development to the effects of the Consented Development, and identify any additional effects that may arise due to the Proposed Development.</p> <p>A long list of developments in the vicinity of the Proposed Development has been identified following a search of the relevant planning databases (National Infrastructure Planning, NELC, NLC and ERYC). This will be reviewed and updated again before the ES is finalised.</p>

CONSULTEE/ DATE	SUMMARY	ADDRESSED
	<p>application.</p> <p>The ES should include an impact assessment to identify, describe and evaluate the effects that are likely to result from the project in combination with other projects and activities that are being, have been or will be carried out. The following types of projects should be included in such an assessment (subject to available information):</p> <ul style="list-style-type: none"> a. existing completed projects; b. approved but uncompleted projects; c. ongoing activities; d. plans or projects for which an application has been made and which are under consideration by the consenting authorities; and e. plans and projects which are reasonably foreseeable, i.e. projects for which an application has not yet been submitted, but which are likely to progress before completion of the development and for which sufficient information is available to assess the likelihood of cumulative and in-combination effects. 	<p>The cumulative effects assessment considers approved but uncompleted projects and projects for which an application has been made and is under consideration. Existing completed projects and ongoing activities are accounted for in the existing baseline conditions. The final ES will also consider cumulative effects with other plans and programmes where sufficient environmental information is available to inform the assessment.</p>
Public Health England October 2019 (Scoping Opinion)	<p>The health and population impacts section should address any potential cumulative impacts as a result of the development, currently approved developments which have yet to be constructed, and proposed developments which do not currently have development consent.</p> <p>Any assessment of impacts arising from emissions or activities due to construction and decommissioning should consider potential impacts on all receptors and describe monitoring and mitigation during these phases. Construction and decommissioning will be associated with vehicle</p>	<p>A long list of developments in the vicinity of the Proposed Development was identified and effects on human receptors such as air quality and noise effects have been assessed.</p> <p>A topic-specific assessment of potential cumulative effects is provided within this Chapter; this includes emissions from the Site and associated road traffic.</p>

CONSULTEE/ DATE	SUMMARY	ADDRESSED
	<p>movements and cumulative impacts should be accounted for.</p> <p>When considering a baseline (of environmental quality) and in the assessment and future monitoring of impacts these should identify cumulative and incremental impacts (i.e. assess cumulative impacts from multiple sources), including those arising from associated development, other existing and proposed development in the local area, and new vehicle movements associated with the proposed development; associated transport emissions should include consideration of non-road impacts (i.e. rail, sea, and air).</p> <p>Neither the EIA regulations nor the National Policy Statements provide a definition of what constitutes a 'significant' effect, and so Public Health England have derived a list of factors which it will take into consideration in the assessment of significance of effects:</p> <ul style="list-style-type: none"> • Will the NSIP's impacts on this determinant combine with effects from other existing or proposed NSIPs or large-scale developments in the area, resulting in an overall cumulative effect different to that of the project alone? • What are the cumulative effects of the impacts of the scheme on communities or populations. Individual impacts individually may not be significant but in combination may produce an overall significant effect. 	<p>As described above, the cumulative effects assessment includes consideration of transport emissions from the Propose Development and other developments proposed within the Zol.</p> <p>The significance of cumulative effects is derived from the topic-specific methodologies described in Chapters 7-16 of this PEI Report.</p>
Natural England 27 June 2018 (Pre-Application)	A pre-application meeting was held between the Applicant and Natural England relating to the Consented Development. Several topics were discussed, including	This meeting has informed the scope of the cumulative effects assessment for the Proposed Development.

CONSULTEE/ DATE	SUMMARY	ADDRESSED
meeting in relation to the Consented Development)	cumulative effects and projects which the Applicant should consider in the assessment. This discussion is also relevant to the Proposed Development assessment.	

17.4 Cumulative Effects Assessment Stages 1-3

Stage 1: Establishing the long list of other existing development and/ or approved development

17.4.1 An initial screening exercise has been undertaken to identify potential major developments and plans within the vicinity of the Proposed Development for consideration within the cumulative effects assessment. This process identified potential major and other developments considered relevant to the assessment within a 10 km radius to create an initial long list for consideration. This initial long list is included as Table 17.3 below.

17.4.2 The process will be repeated and refined for the final ES.

Stage 2: Identification of Short List of Other Developments for Assessment

17.4.3 The long list was subsequently screened, based on the potential for impact (e.g. cumulative landscape and visual impacts have potential to occur over a greater distance than, for example, cumulative noise or archaeology impacts) and a refined short list was developed for further, more detailed consideration. This selection process and rationale for additional assessment, where required, is summarised in Table 17.3.

17.4.4 The short list of other developments identified for the cumulative effects assessment are presented in Table 17.4 below, with details of their current status and comments regarding likely timescales. The short list will be reviewed for the final ES.

17.4.5 Where individual technical disciplines have scoped out assessment of developments included on the short list for the purposes of their cumulative assessment, the reasoning for this is set out in each section of this Chapter. The approved or proposed boundaries and locations of the other developments included on the short list are shown in relation to the Proposed Development boundary on Figure 17.1.

Table 17.3: Long list of developments to be considered for inclusion within the assessment of cumulative effects

APPLIC- ATION REF- ERENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SITE ADDRESS	DISTANCE FROM SITE	STATUS (AT OCTOBER 2019)	ENVIRONMENTAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	CARRIED FORWARD TO SHORT LIST?
DM/0094/ 18/ FUL	Construction and modifications of a single carriageway highway link with shared cycle & footway from Moody Lane/ Woad Lane junction (to the south east) to Hobson Way Roundabout (to the north west) with associated works including drainage works, street lighting, fencing and landscaping.	Stalling-borough Link Road, Energy Park Way, Grimsby, North East Lincolnshire	Immediately adjacent to the south	Approved with Conditions (September 2018) Construction commenced early 2019	Air Quality Assessment, Ecological Assessment, Transport Assessment, Flood Risk Assessment, Visual Impact Assessment, Habitats Regulations Assessment, Tree Report, Lighting Report, Geo-environmental Interpretative Report.	Yes due to proximity – immediately adjacent to the Site.
DM/0147/ 16/ FUL	Engineering works and use of land for external car parking, internal site access works, boundary works, and other associated works.	Rear of Paragon House, Kiln Lane, Stallingborough, North East Lincolnshire	410 m to the west	Approved with Conditions (June 2016)	Environmental Statement, Transport Assessment, Flood Risk Assessment, Landscape and Visual Scoping Report, Air Quality Screening Assessment.	Yes due to proximity – within 1 km.

APPLIC- ATION REF- ERENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SITE ADDRESS	DISTANCE FROM SITE	STATUS (AT OCTOBER 2019)	ENVIRONMENTAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	CARRIED FORWARD TO SHORT LIST?
DM/0195/ 17/ FUL	<p>Erection of industrial building and adjoined two storey office/ control room to create power plant (18MW Energy from Waste) including construction of associated access, hardsurfacing, erection of 55m chimney stack and installation of necessary plant and machinery.</p> <p>Great Coates Renewable Energy Centre.</p>	Vireol Plc Energy, Park Way, Grimsby, North East Lincolnshire DN31 2TT.	560 m to the south	Approved with Conditions (August 2017)	Environmental Statement, Transport Statement, Outline Traffic Management Plan, Transport Assessment, Noise Assessment, Human Health Risk Assessment, Habitat Regulations Assessment, Flood Risk Assessment, Phase 1 Environmental Assessment, Cultural Heritage Desk Based Appraisal, Ecology Report, Landscape and Visual Appraisal, Air Quality Assessment.	<p>No – application re-submitted with amended details under reference DM/0329/18/ FUL. Covering letter with application DM/0329/18/ FUL states the revised application “<i>would operate in essentially the same way as set out in the original planning application; the changes would not result in any further significant environmental effects.</i>”</p> <p>On this basis DM/0329/18/ FUL has been included in the short list.</p>

APPLIC- ATION REF- ERENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SITE ADDRESS	DISTANCE FROM SITE	STATUS (AT OCTOBER 2019)	ENVIRONMENTAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	CARRIED FORWARD TO SHORT LIST?
DM/1050/ 16/FUL	Change of use to allow business (Use Class B1) and/ or general industrial (Use Class B2) and/ or storage and distribution (Use Class B8) across the site and reconfiguration of car parking.	Worldwide Way, Kiln Lane Trading Estate Access Road, Stalling-borough, Grimsby, North East Lincolnshire DN41 8DY.	1.22 km to the north-west	Approved with Conditions (March 2017) Development completed.	Flood Risk Assessment.	No – development now completed.
DM/0848/ 14/FUL	Development of a renewable power facility for the production of electricity using pre-treated fuel feedstocks including tyres and carpets processed on site with ancillary storage, lorry and car provision and widening of existing access off Europa Way.	Plot Q, Kiln Lane Industrial Estate, Europa Way, Stalling-borough, North East Lincolnshire	1.60 km to the north-west	Approved with Conditions (April 2016)	Ecology and Protected Species Survey, Transport Assessment, Environmental Risk Assessment, Flood Risk Assessment, Drainage Presentation, Supporting Emissions Statement, Permit Application, Emissions Evidence.	Yes due to type of development and proximity – within 2 km.

APPLIC- ATION REF- ERENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SITE ADDRESS	DISTANCE FROM SITE	STATUS (AT OCTOBER 2019)	ENVIRONMENTAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	CARRIED FORWARD TO SHORT LIST?
DM/0449/ 17/FUL	Install 4 CHP boilers internally to include the erection of associated flues.	Selvic Shipping Ltd, Netherlands Way, Stallingborough, Grimsby, North East Lincolnshire DN41 8DF.	1.79 km to the north-west	Approved with Conditions (August 2017)	Emissions Report, Flood Risk Assessment.	Yes due to proximity – within 5 km.
DM/0333/ 17/FUL	Develop waste tyre to energy pyrolysis plant at disused Immingham Railfreight Terminal. Erect industrial building and installation of various plant and machinery across the site to include the creation of access, hardstanding/ parking, boundary fencing and balancing pond.	Immingham Railfreight Terminal, Scandinavian Way, Stallingborough, Grimsby, North East Lincolnshire	1.80 km to the north-west	Approved with Conditions (December 2017) This is the same site footprint as application DM/0628/18/ FUL i.e. only one of these two developments is likely to be implemented.	Landscape and Visual Impact Assessment, Contaminated Land Appraisal, Surface Water Drainage Strategy, Air Quality Assessment, Transport and Traffic Assessment, Flood Risk Assessment, Ecological Appraisal.	Yes due to type of development and proximity – within 5 km.

APPLIC- ATION REF- ERENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SITE ADDRESS	DISTANCE FROM SITE	STATUS (AT OCTOBER 2019)	ENVIRONMENTAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	CARRIED FORWARD TO SHORT LIST?
PA/2018/1 55	Planning permission to construct 9 lagoons for the storage of surface water associated with the dewatering of cable trenches for the Hornsea Project One Offshore Windfarm Project.	Fields north of Chase Hill Road, fields west of East Field Road and land east and west of Top Road, South Killingholme	4.8 km to the south-west	Approved with Conditions (March 2018)	Flood Risk Assessment, Ecological walkover technical note.	No due to distance and that the type of development is highly unlikely to result in significant cumulative effects.
DM/0153/ 17/FUL	Additional area to be added to the temporary site construction compound to support the onshore cable installation and HDD for Hornsea Project One.	Site of Wind Farm Compound, Grimsby Road, Laceby, North East Lincolnshire	6.07 km to the south	Approved with Conditions (May 2017)	None.	No due to distance and that the type of development proposed is highly unlikely to result in significant cumulative effects.

APPLIC- ATION REF- ERENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SITE ADDRESS	DISTANCE FROM SITE	STATUS (AT OCTOBER 2019)	ENVIRONMENTAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	CARRIED FORWARD TO SHORT LIST?
PA/2018/9 18	Planning permission to construct a new gas- fired power station with a gross electrical output of up to 49.9 megawatts. VPI Immingham Energy Park A.	VPI- Immingham Energy Park A, Rosper Road, South Killingholme DN40 3DZ.	6.73 km to the north- west	Approved with Conditions (September 2018)	Environmental Statement, Ecology Assessment, Air Quality Assessment, Noise and Vibration Assessment, Landscape and Visual Impact Assessment, Transport Statement, Flood Risk Assessment, Phase 1 Environmental Assessment, Cultural Heritage Assessment, Cumulative and Combined Effects.	Yes, although beyond 5 km from the Site the type of development proposed has the potential to result in significant cumulative effects.

APPLIC- ATION REF- ERENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SITE ADDRESS	DISTANCE FROM SITE	STATUS (AT OCTOBER 2019)	ENVIRONMENTAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	CARRIED FORWARD TO SHORT LIST?
TWA 8/1/13	A160 – A180 Port of Immingham Improvement.	South Killingholme	5.93 km to the north- west	Development Consent granted (Feb 2015) Development completed.	Environmental Statement, Air Quality Assessment, Cultural Heritage Assessment, Landscape and Visual Assessment, Ecology and nature Conservation Assessment, Geology and Soils Assessment, Materials Assessment, Noise and Vibration Assessment, Effects on All Travellers, Community and Private Assets Assessment, Road Drainage and Water Environment Assessment, Cumulative Effects Assessment.	No due to the fact that the development has now been completed.
EN060004	River Humber Gas Pipeline Replacement Project.	River Humber	12.35 km to the north- west	Development Consent granted (August 2016)	Environmental Statement, Habitats Regulations Assessment.	No due to distance.

APPLIC- ATION REF- ERENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SITE ADDRESS	DISTANCE FROM SITE	STATUS (AT OCTOBER 2019)	ENVIRONMENTAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	CARRIED FORWARD TO SHORT LIST?
DM/0329/ 18/FUL (re- submissio n of DM/0195/ 17/FUL)	Erection of industrial building and adjoined two storey office/ control room to create power plant (18MW energy from waste) including construction of associated access, hardsurfacing, erection of 65m chimney stack and installation of necessary plant and machinery (AMENDED PLANS/DESCRIPTION). Great Coates Renewable Energy Centre.	Vireol Plc Energy, Park Way, Grimsby, North East Lincolnshire DN31 2TT	560 m to the south	Approved with Conditions (January 2019)	Environmental Statement, Transport Statement, Outline Traffic management Plan, Noise Assessment, Human Health Risk Assessment, Habitat Regulations Assessment, Flood Risk Assessment, Phase 1 Environmental Assessment, Cultural Heritage Desk Based Appraisal, Ecology Report, Landscape and Visual Appraisal.	Yes due to type of development and proximity – within 1 km.

APPLIC- ATION REF- ERENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SITE ADDRESS	DISTANCE FROM SITE	STATUS (AT OCTOBER 2019)	ENVIRONMENTAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	CARRIED FORWARD TO SHORT LIST?
DM/0628/ 18/FUL	Partially demolish existing building and erect 20MW waste to energy power generation facility and associated plant, machinery, parking and external works.	Immingham Railfreight Terminal, Scandinavian Way, Stallingborough, Grimsby, North East Lincolnshire DN41 8DT.	1.80 km to the north-west	Approved with Conditions (December 2018) This is the same site footprint as application DM/0333/17/FUL i.e. only one of these two developments is likely to be implemented.	Travel Plan, Transport Assessment, Noise Impact Assessment, Landscape and Visual Impact Assessment, Ecology Statement, Cultural Heritage Assessment, Socio-Economics, Major Accidents and Disasters, Flood Risk Drainage and Water, Noise, Human Health, Air Quality and Climate Change, Site Selection and Alternatives.	Yes due to type of development proposed and proximity – within 5 km.



APPLIC- ATION REF- ERENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SITE ADDRESS	DISTANCE FROM SITE	STATUS (AT OCTOBER 2019)	ENVIRONMENTAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	CARRIED FORWARD TO SHORT LIST?
DM/0026/ 18/FUL	Erect an Energy Recovery Facility with an electricity export capacity of up to 49.5MW and associated infrastructure including a stack to 90m high, parking areas, hard and soft landscaping, access road, weighbridge facility and drainage infrastructure.	Land South of Queens Road, Immingham North East Lincolnshire	c.1.96 km to the north-west	Approved with Conditions (October 2018)	Landscape and Visual Impact Assessment, Ecology and Nature Conservation, Noise and Vibration, Air Quality and Human Health, Soils, Geology and Hydrogeology, Surface water and Flood Risk, Socio-Economics, Archaeology and Cultural Heritage.	Yes due to type of development proposed and proximity – within 5 km.



APPLIC- ATION REF- ERENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SITE ADDRESS	DISTANCE FROM SITE	STATUS (AT OCTOBER 2019)	ENVIRONMENTAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	CARRIED FORWARD TO SHORT LIST?
DM/0105/ 18/FUL	Hybrid application seeking outline consent with access, landscaping and scale to be considered for the development of a 62 ha Business Park comprising up to 120,176 sq. m for B1 (Business), B2 (General Industrial) and B8 (Storage and Distribution), associated infrastructure and internal highways. Full application for the creation of a new roundabout, new access roads, associated highway works, substations, pumping stations, drainage and landscaping.	Land Off Stalling-borough Interchange Kiln Lane, Stalling-borough, North East Lincolnshire	1.83 km to the west	Approved with Conditions (October 2018)	Transport, Noise and Vibration, Air Quality, Cultural Heritage, Ecology and nature Conservation, Ground Conditions and Contamination, Water Quality, Flood Risk and Drainage, Landscape and Visual, Land Use and Agricultural, Socio-economics, Cumulative.	Yes due to type of development and proximity – within 2 km.



APPLIC- ATION REF- ERENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SITE ADDRESS	DISTANCE FROM SITE	STATUS (AT OCTOBER 2019)	ENVIRONMENTAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	CARRIED FORWARD TO SHORT LIST?
DM/1146/ 17/FUL	Additional land for temporary dewatering areas (30m x 30m) including creation of bunding around a lagoon and the installation of a separate settlement tank and pump for Hornsea Project One Offshore Wind Farm (falls within Stallingborough, Laceby, Immingham, Habrough, Healing and Bradley Parishes).	North East Lincolnshire Area, Keelby Road, Stallingborough, North East Lincolnshire	4.76 km to the west (at closest point)	Approved with Conditions (May 2019)	Ecological Walkover Survey Report.	No, although just within 5 km the type of development proposed is highly unlikely to result in significant cumulative effects and there is limited environmental information available.
EN10097	VPI-Immingham OCGT DCO.	Land north of VPI Power Station, Rosper Road, South Killingholme DN40 3DZ.	6.85 km to the north-west	Development Consent application submitted April 2019, currently in Examination.	Environmental Statement, Transport Assessment, Flood Risk Assessment.	Yes due to type of development.

APPLIC- ATION REF- ERENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SITE ADDRESS	DISTANCE FROM SITE	STATUS (AT OCTOBER 2019)	ENVIRONMENTAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	CARRIED FORWARD TO SHORT LIST?
DM/0664/ 19/FUL	Development of a sustainable transport fuels facility, including various stacks up to 80 m high, creation of new accesses, installation of pipe lines, rail link, associated infrastructure and ancillary works.	Land at Hobson Way, Stalling-borough, North East Lincolnshire	Approximat- ely 30 m to the west.	Pending consideration	Environmental Statement, Transport Assessment and Travel Plan, Flood Risk Assessment, Habitats Regulations Screening Report.	Yes due to the type of development and proximity adjacent to the Site.
DM/0902/ 18/FUL	Erection of 3 storey office building and facilities block with associated car parking, access and landscaping.	Land off Pelham Road, Immingham North East Lincolnshire	Approximat- ely 4.2 km to north- west	Approved with Conditions (February 2019)	Traffic Assessment and Travel Plan, Air Quality Assessment, Ecological Appraisal.	No due to the type of development and distance from Site (over 4 km away with no visibility of Site due to intervening screening).
DM/0728/ 18/OUT	Outline planning application for the development of up to 525 residential dwellings together with an extra care facility for the elderly with up to 80 units with access to be considered.	Highfield House, Stalling-borough Road, Immingham North East Lincolnshire	Approximat- ely 4.5 km to west/ north-west	Pending Decision	Air Quality Assessment, Ecological Appraisal, Flood Risk Assessment, Heritage Assessment, Noise Assessment, Geo-environmental Assessment, Transport Assessment and Travel Plan.	No due to the type of development and distance from Site (approximately 4.5 km to the west/ north- west).

Table 17.4: Short list of developments to be considered for inclusion within the assessment of cumulative effects


DEVELOP- MENT REFER- ENCE (SEE FIGURE 17.1)	APPLICA- TION REFER- ENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SHORT NAME	DISTANCE FROM PROPOSED DEVELOP- MENT	STATUS (AT TIME OF ASSESS- MENT)	ENVIRONMEN- TAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	DEVELOP- MENT TIME- SCALES (IF KNOWN)
1 	DM/0094/ 18/FUL	Construction and modifications of a single carriageway highway link with shared cycle & footway from Moody Lane/ Woad Lane junction (to the south east) to Hobson Way Roundabout (to the north west) with associated works including drainage works, street lighting, fencing and landscaping.	Stalling- borough Link Road	Immediately adjacent (to the south)	Approved with Conditions (September 2018) Construction commenced early 2019	Air Quality Assessment, Ecological Assessment, Transport Assessment, Flood Risk Assessment, Visual Impact Assessment, Habitats Regulations Assessment, Tree Report, Lighting Report, Geo-environmental Interpretative Report.	Project due to be completed mid-2020.
2 	DM/0664/ 19/FUL	Development of a sustainable transport fuels facility, including various stacks up to 80 m high, creation of new accesses, installation of pipe lines, rail link, associated infrastructure and ancillary works.	Sustaina- ble Transport Fuels Facility	Approximat- ely 30 m to the west.	Pending consideration	Environmental Statement, Transport Assessment and Travel Plan, Flood Risk Assessment, Habitats Regulations Screening Report.	4 year construction programme, starting in 2021.


DEVELOP- MENT REFER- ENCE (SEE FIGURE 17.1)	APPLICA- TION REFER- ENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SHORT NAME	DISTANCE FROM PROPOSED DEVELOP- MENT	STATUS (AT TIME OF ASSESS- MENT)	ENVIRONMEN- TAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	DEVELOP- MENT TIME- SCALES (IF KNOWN)
3 	DM/0147/ 16/FUL	Engineering works and use of land for external car parking, internal site access works, boundary works, and other associated works.	Engineer- ing works - Paragon House	410 m to the west	Approved with Conditions (June 2016)	Environmental Statement, Transport Assessment, Flood Risk Assessment, Landscape and Visual Scoping Report, Air Quality Screening Assessment.	Timing details not available - assumed construction to start late 2019 due to planning condition.
4 	DM/0848/ 14/FUL	Development of a renewable power facility for the production of electricity using pre-treated fuel feedstocks including tyres and carpets processed on site with ancillary storage, lorry and car provision and widening of existing access off Europa Way.	Renewa- ble power facility - Kiln Lane	1.60 km to the north-west	Approved with Conditions (April 2016)	Ecology and Protected Species Survey, Transport Assessment, Environmental Risk Assessment, Flood Risk Assessment, Drainage Presentation, Supporting Emissions Statement, Permit Application, Emissions Evidence.	The construction period for the development is forecast to be around 12 months.


DEVELOPMENT REFERENCE (SEE FIGURE 17.1)	APPLICATION REFERENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SHORT NAME	DISTANCE FROM PROPOSED DEVELOPMENT	STATUS (AT TIME OF ASSESSMENT)	ENVIRONMENTAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	DEVELOPMENT TIME-SCALES (IF KNOWN)
5 	DM/0449/17/FUL	Install 4 CHP boilers internally to include the erection of associated flues.	Selvic Shipping CHP Boilers	1.79 km to the north-west	Approved with Conditions (August 2017)	Emissions Report, Flood Risk Assessment.	Not known.
6 	DM/0333/17/ FUL	Develop waste tyre to energy pyrolysis plant at disused Immingham Railfreight Terminal. Erect industrial building and installation of various plant and machinery across the site to include the creation of access, hardstanding/parking, boundary fencing and balancing pond.	Waste Tyre Pyrolysis – Immingham Railfreight	1.80 km to the north-west	Approved with Conditions (December 2017) This is the same site footprint as application DM/0628/18/ FUL ¹	Landscape and Visual Impact Assessment, Contaminated Land Appraisal, Surface Water Drainage Strategy, Air Quality Assessment, Transport and Traffic Assessment, Flood Risk Assessment, Ecological Appraisal.	Construction not yet started – application DM/0628/18 /FUL is for the same site footprint.



¹ Approved development reference DM/0333/17/FUL occupies the same space as approved development reference DM/0628/18/FUL. Whilst the cumulative effects assessment would conventionally consider only the approved development, construction has not yet begun (to the best of knowledge at the time of undertaking this assessment) and as they occupy the same site both developments cannot be

NAME OF DEVELOPMENT/ DESCRIPTION	SHORT NAME	DISTANCE FROM PROPOSED DEVELOP- MENT	STATUS (AT TIME OF ASSESS- MENT)	ENVIRONMEN- TAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	DEVELOP- MENT TIME- SCALES (IF KNOWN)
Planning permission to construct a new gas-fired power station with a gross electrical output of up to 90 megawatts.	VPI- Imming- ham Energy Park A	6.73 km to the north- west	Approved with Conditions (September 2018)	Environmental Statement, Ecology Assessment, Air Quality Assessment, Noise and Vibration Assessment, Landscape and Visual Impact Assessment, Transport Statement, Flood Risk Assessment, Phase 1 Environmental Assessment, Cultural Heritage Assessment, Cumulative and Combined Effects.	Anticipated construction start was early 2019 over 18 months to be completed mid-2020.

DEVELOP- MENT REFER- ENCE (SEE FIGURE 17.1)	APPLICA- TION REFER- ENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SHORT NAME	DISTANCE FROM PROPOSED DEVELOP- MENT	STATUS (AT TIME OF ASSESS- MENT)	ENVIRONMEN- TAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	DEVELOP- MENT TIME- SCALES (IF KNOWN)
8 	DM/0329/ 18/FUL (re- submiss- ion of DM/0333/ 17/FUL)	Erection of industrial building and adjoined two storey office/control room to create power plant (18 MW Energy from Waste) including construction of associated access, hardsurfacing, erection of 65m chimney stack and installation of necessary plant and machinery (AMENDED PLANS/DESCRIPTION).	Great Coates Renewable Energy Centre	560 m to the south	Approved with Conditions (January 2019)	Environmental Statement, Transport Statement, Outline Traffic management Plan, Noise Assessment, Human Health Risk Assessment, Habitat Regulations Assessment, Flood Risk Assessment, Phase 1 Environmental Assessment, Cultural Heritage Desk Based Appraisal, Ecology Report, Landscape and Visual Appraisal.	The construction period for the development is forecast to be around 30 months.

DEVELOP- MENT REFER- ENCE (SEE FIGURE 17.1)	APPLICA- TION REFER- ENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SHORT NAME	DISTANCE FROM PROPOSED DEVELOP- MENT	STATUS (AT TIME OF ASSESS- MENT)	ENVIRONMEN- TAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	DEVELOP- MENT TIME- SCALES (IF KNOWN)
9 	DM/0628/ 18/FUL	Partially demolish existing building and erect 20MW _E waste to energy power generation facility and associated plant, machinery, parking and external works.	Waste to Energy – Immingham Railfreight	1.80 km to the north-west	Approved with Conditions (December 2018) This is the same site footprint as application DM/0333/17/FUL ¹	Travel Plan, Transport Assessment, Noise Impact Assessment, Landscape and Visual Impact Assessment, Ecology Statement, Cultural Heritage Assessment, Socio-Economics, Major Accidents and Disasters, Flood Risk Drainage and Water, Noise, Human Health, Air Quality and Climate Change, Site Selection and Alternatives.	Construc- tion planned 2019/ 2020 and fully operational from 2021 with design life of 20 years.

DEVELOPMENT REFERENCE (SEE FIGURE 17.1)	APPLICATION REFERENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SHORT NAME	DISTANCE FROM PROPOSED DEVELOPMENT	STATUS (AT TIME OF ASSESSMENT)	ENVIRONMENTAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	DEVELOPMENT TIME-SCALES (IF KNOWN)
10 	DM/0026/18/FUL	Erect an Energy Recovery Facility with an electricity export capacity of up to 49.5 MW and associated infrastructure including a stack to 90 m high, parking areas, hard and soft landscaping, access road, weighbridge facility and drainage infrastructure.	North Beck Energy Centre (NBEC)	c.1.96 km to the north-west	Approved with Conditions (October 2018)	Landscape and Visual Impact Assessment, Ecology and Nature Conservation, Noise and Vibration, Air Quality and Human Health, Soils, Geology and Hydrogeology, Surface water and Flood Risk, Socio-Economics, Archaeology and Cultural Heritage.	The construction period for the development is forecast to be 39 months. The facility was programmed to open in early 2022 but construction has not yet started. Construction assumed to occur coincident with the Proposed Development (as a worst case).

DEVELOPMENT REFERENCE (SEE FIGURE 17.1)	APPLICATION REFERENCE	NAME OF DEVELOPMENT/ DESCRIPTION	SHORT NAME	DISTANCE FROM PROPOSED DEVELOPMENT	STATUS (AT TIME OF ASSESSMENT)	ENVIRONMENTAL INFORMATION AVAILABLE TO INFORM THE ASSESSMENT	DEVELOPMENT TIME-SCALES (IF KNOWN)
11 	DM/0105/18/FUL	Hybrid application seeking outline consent with access, landscaping and scale to be considered for the development of a 62ha Business Park comprising up to 120,176 sq. m for B1 (Business), B2 (General Industrial) and B8 (Storage and Distribution), associated infrastructure and internal highways. Full application for the creation of a new roundabout, new access roads, associated highway works, substations, pumping stations, drainage and landscaping.	Stallingborough Interchange – Business Park	1.83 km to the west	Approved with Conditions (October 2018)	Transport, Noise and Vibration, Air Quality, Cultural Heritage, Ecology and nature Conservation, Ground Conditions and Contamination, Water Quality, Flood Risk and Drainage, Landscape and Visual, Land Use and Agricultural, Socio-economics, Cumulative.	Phase 1A (26,353 m ²) 2018 – 2022, Phase 1B (43,103 m ²) 2020 – 2024, Phase 2 (50,720 m ²) 2023 – 2032.
12 	EN10097	VPI-Immingham OCGT DCO.	VPI-Immingham OCGT DCO	6.85 km to the north-west	Development Consent application submitted April 2019, currently in Examination	Environmental Statement, Transport Assessment, Flood Risk Assessment.	3 year construction programme, earliest operation in 2023.

Electrical and Gas Connection Works

- 17.4.6 Chapter 4 of the PEI Report provides a description of the Proposed Development and includes a brief description of the electrical and gas connections that will be required.
- 17.4.7 On site electrical connection works and gas connection works have been assessed as part of the EIA. However, any electrical connection works outside of the Site boundary, whilst required for the development, do not form part of the Application and the relevant undertaker will rely either on their statutory powers or obtain the relevant consents prior to connection. Similarly, if a connection to an off-site gas distribution network were required, this would also require a separate consent to be obtained by the relevant undertaker. The routes of these connections are not yet known. For all these reasons, any potential off-site works for these connections have not been assessed in the EIA.
- 17.4.8 It is also considered that consent would only be granted for these works once the relevant authority was satisfied that the works could be undertaken, in their own right, without the potential for any significant effect either in isolation or with regards to any other development being undertaken at that time. This would be demonstrated either through the planned implementation of best practice measures or by securing a commitment to any further mitigation measures deemed necessary by the consenting authority at that time.
- 17.4.9 On the basis of the above and taking into consideration the relatively minor nature of these works it is considered that there is no potential for any significant cumulative effects with the construction or the operation of the Proposed Development or the implementation of the developments included in Table 17.4.
- 17.4.10 The off Site electrical connection works and gas connection works are therefore not considered further in the cumulative effects assessment.

17.5 Cumulative Air Quality Effects

- 17.5.1 Table 17.5 below summarises how each of the developments included in the short list (Table 17.4) have been considered with regards to potential cumulative effects.

Table 17.5: Scope of air quality cumulative assessment

DEVELOPMENT REFERENCE	ADMS 5 DISPERSION MODELLING	ADMS ROADS MODELLING ASSESSMENT
1. Stallingborough Link Road	Scoped out No point sources associated with this development.	Scoped in
2. Sustainable Transport Fuels Facility	Scoped in Note the ADMS 5 dispersion modelling reported in this PEI Report has not yet been updated to include this development – this will be reported in the final ES.	Scoped in
3. Engineering works – Paragon House	Scoped out Minimal point source emissions.	Scoped in
4. Renewable power facility – Kiln Lane	Scoped out Available information is not sufficient to enable replication of ADMS 5 dispersion modelling.	Scoped in

DEVELOPMENT REFERENCE	ADMS 5 DISPERSION MODELLING	ADMS ROADS MODELLING ASSESSMENT
5. Selvic Shipping CHP Boilers	Scoped out Available information is not sufficient to enable replication of ADMS 5 dispersion modelling.	Scoped out
6. Waste Tyre Pyrolysis – Immingham Railfreight	Scoped in	Scoped in
7. VPI Immingham Energy Park A	Scoped in	Scoped out Traffic for this development is unlikely to affect the transport study area for the Proposed Development.
8. Great Coates Renewable Energy Centre	Scoped in	Scoped out Traffic for this development is unlikely to affect the transport study area for the Proposed Development.
9. Waste to Energy Immingham Railfreight	Scoped out This development occupies the same space as Development Ref: 6 and it is not possible for both developments to occur. Development Ref: 6 is included in the assessment on the basis that it represents the worst case scenario in terms of emissions.	Scoped out This development occupies the same space as Development Ref: 6 and it is not possible for both developments to occur. Development Ref: 6 is included in the assessment on the basis that it represents the worst case scenario in terms of traffic (see section 17.7).
10. North Beck Energy Centre	Scoped in	Scoped in
11. Stallingborough Interchange – Business Park	Scoped out The information provided in the planning application is inadequate to undertake dispersion modelling.	Scoped in
12. VPI Immingham OCGT DCO	Scoped in Note the ADMS 5 dispersion modelling reported in this PEI Report has not yet been updated to include this development – this will be reported in the final ES.	Scoped in

Construction Cumulative Effects – Human Receptors

Dust

- 17.5.2 The air quality assessment (see Chapter 7: Air Quality) concludes that, with appropriate mitigation in place, the dust and particulates arising as a result of activities undertaken during the construction phase would be likely to result in negligible effects at all of the identified human receptors and that the effect will not therefore be significant. On this

basis there is no potential for a significant cumulative effect on receptors outside of the Site as a result of dust and particulates.

Construction Traffic

- 17.5.3 The magnitude of the change in pollutant concentrations due to construction traffic on the road network due to the Proposed Development is predicted to be imperceptible or very low for all pollutants at all receptor locations. A change of this magnitude is considered to have a negligible effect, which is considered to be not significant. On this basis there is no potential for a significant cumulative effect as a result of construction traffic.

Construction Cumulative Effects – Ecological Receptors

- 17.5.4 The Humber Estuary SPA/ SAC/ Ramsar site is over the screening distance of 50 m from the construction works; therefore an assessment of construction dust impacts on ecological receptors has not been undertaken and it is predicted that there will be no significant effect on this receptor. On this basis there is no potential for a significant cumulative effect on this receptor as a result of construction dust.

Operational Cumulative Effects - Human Receptors

Odour

- 17.5.5 The air quality assessment (see Chapter 7) concludes that fugitive odour emissions from the Proposed Development would be likely to result in very low or low impacts at all locations outside of the Site, producing effects of negligible significance. On this basis there is no potential for a significant cumulative effect on human receptors outside of the Site as a result of odour.

Proposed Development Stacks and Operational Road Traffic

- 17.5.6 The advanced dispersion modelling ADMS 5 modelled the potential cumulative effects from the Proposed Development alongside the operation of the developments as identified in Table 17.3 above. The technical findings of the modelling can be found in Annex D of Appendix 7A in the PEI Report Volume III.
- 17.5.7 Annual mean nitrogen dioxide concentrations at all of the identified sensitive human receptor locations remain below the air quality standard. R8 (located just north of the A180) and R21 located within Grimsby AQMA are predicted to experience a minor adverse effect in terms of the change in nitrogen dioxide concentrations due to the emissions from the other modelled developments.
- 17.5.8 Annual mean particulate matter and fine particulate matter concentrations at all of the identified sensitive human receptor locations remain below the air quality standard. All sensitive human receptor locations are predicted to experience a negligible change in particulate matter concentrations due to the emissions from the other identified developments.
- 17.5.9 The maximum cumulative process contribution within the modelled domain for sulphur dioxide, carbon monoxide, hydrogen chloride, hydrogen fluoride, lead, mercury, antimony, cadmium, chromium, copper, manganese and vanadium remain below their representative environmental standards at all identified sensitive human receptor locations. Dioxins and furans remain well below the background pollutant concentrations.
- 17.5.10 Arsenic, chromium (VI), nickel and Polycyclic Aromatic Hydrocarbons (PAH) as benzo[a]pyrene required more specific modelling due to their contribution from each assessed development being greater than one percent of the environmental standard. Modelling undertaken using emission concentrations from similar energy from waste

plants identified in the short list resulted in the total concentrations remaining small and insignificant. The maximum concentrations of chromium (VI), arsenic and nickel are located in the Humber Estuary far from the identified sensitive human receptor locations. The maximum concentrations of Polycyclic Aromatic Hydrocarbons (PAH) as benzo[a]pyrene are located adjacent to the Paragon House Engineering Works and North Beck Energy Centre so cannot be attributed to the Proposed Development; the Proposed Development contribution at these locations represents 0.003% of the air quality standard, which can be screened as insignificant.

- 17.5.11 On the basis of the information available, the cumulative air quality assessment has not identified any significant cumulative air quality effects on human receptors as a result of the Proposed Development and the other developments identified and assessed.

Operational Cumulative Effects - Ecological Receptors

- 17.5.12 The modelling results show that the predicted impacts are within the criteria for insignificance at most of the selected receptors. A cumulative Process Contribution (PC) of more than 1% of the long term Critical Load has been predicted to occur at receptor E4, within the Humber Estuary SAC (Acid Fixed Dunes), in respect of acid deposition, in an area which already exceeds the relevant standard, if all the identified developments are implemented.
- 17.5.13 At the acid fixed dunes, the cumulative PC from all the identified developments to acid deposition is 1.5% of the lower range Critical Load. The PC from the Proposed Development alone was 0.6% of the lower range Critical Load.
- 17.5.14 The significance of the potential cumulative air quality effects on sensitive ecological receptors is discussed in Section 17.8 below.

17.6 Cumulative Noise and Vibration Effects

- 17.6.1 The developments that have been scoped into the cumulative noise and vibration assessment are:

- Stallingborough Link Road (Development Ref: 1);
- Sustainable Transport Fuels Facility (Development Ref: 2);
- Engineering works – Paragon House (Development Ref: 3);
- Great Coates Renewable Energy Centre (Development Ref: 8);
- North Beck Energy Centre (Development Ref: 10); and
- Stallingborough Interchange - Business Park (Development Ref: 11).

- 17.6.2 The other developments included on the short list (Table 17.4) have been scoped out of the noise and vibration cumulative assessment due to the distances from the Proposed Development Site and from the identified nearest sensitive receptors (NSRs) and/ or limited availability of information. Cumulative impacts have been considered at different receptor locations should individual developments be constructed and/ or operated at the same time as the Proposed Development. An assessment has also been undertaken of the potential for significant cumulative effects on the NSRs identified for the Proposed Development as a result of all of the aforementioned developments collectively being progressed in parallel with the Proposed Development.

Stallingborough Link Road (Development Ref: 1)

- 17.6.3 The noise assessment undertaken for the Stallingborough Link Road considers receptors within a series of defined Study Areas. The receptors assessed include residential dwellings at Woad Lane (to the south of the A180 on the edge of Grimsby)

and on identified Greenfield areas 2 km from the high tide of the Humber Estuary and the Humber Estuary SPA.

- 17.6.4 The assessment predicts a negligible magnitude of impact at all of the residential receptors on Woad Lane except one where there is predicted to be no change as a result of the project.
- 17.6.5 The assessment predicts that the noise impact on dwellings outside of the specified Study Areas is likely to be negligible and predicts that the noise impact of the Link Road development on both the Humber Estuary SPA and the Greenfield areas is negligible. Overall it is predicted that the noise effect on all receptors from the Link Road will not be significant.
- 17.6.6 The noise assessment undertaken for the Stallingborough Link Road predicts that noise levels ($L_{A10,18hr}$) in the short term or long term may increase by more than 1 dB or 3 dB because of the construction of a new link road – presumably within the defined Study Areas.
- 17.6.7 The NSRs identified for the Proposed Development, as detailed at Chapter 8: Noise and Vibration of this PEI Report, fall outside of the Study Area for the Stallingborough Link Road. The NSR to the Proposed Development that is closest to the Study Area for the Stallingborough Link Road is R2.
- 17.6.8 On the basis that the noise assessment undertaken for the Proposed Development predicts that the magnitude of impact (for both construction and operational noise) will be negligible at this location (R2) and therefore the effect will be negligible adverse (not significant), it is considered that the construction and operation of the Proposed Development at the same time as the construction or use of the new Link Road would not result in a significant cumulative noise effect.

Sustainable Transport Fuels Facility (Development Ref: 2)

Construction Noise

- 17.6.9 The noise assessment undertaken for the Sustainable Transport Fuels Facility (STFF) includes 2 receptors in common with the noise assessment included at Chapter 8: Noise and Vibration of this PEI Report; R1 (Poplar Farm) and R2 (Cress Cottage).
- 17.6.10 The highest construction noise level predicted at Poplar Farm as a result of the STFF is 53 dB, which is assessed as not significant. The highest predicted noise level from the construction of the Proposed Development at Poplar Farm is 48 dB, resulting in a cumulative construction noise level of 54 dB L_{Aeq} . This is equal to the measured ambient noise level resulting in an assessment of no significant cumulative operational effect should the construction of the STFF and the Proposed Development coincide.
- 17.6.11 The highest construction noise level predicted at Cress Cottage as a result of the STFF is 53 dB, which is assessed as not significant. The highest predicted noise level from the construction of the Proposed Development at Cress Cottage is 48 dB, resulting in a cumulative construction noise level of 54 dB L_{Aeq} . This is substantially below the measured ambient noise level of 65 dB L_{Aeq} , resulting in an assessment of no significant cumulative operational effect should the construction of the STFF and the Proposed Development coincide.
- 17.6.12 No assessment of ecological sites was provided in the STFF ES. However, given the predicted noise levels at residential receptors, it is judged that noise levels to the ecological sites considered in this PEI Report will not significantly add to those resulting from the Proposed Development.

Construction Vibration

- 17.6.13 The construction vibration assessment for the STFF concluded that there were no significant effects at surrounding residential receptors. No assessment of ecological sites was provided. However, given the predicted vibration levels at residential receptors, it is judged that vibration levels to the ecological sites considered in this PEI Report will not significantly add to those resulting from the Proposed Development.
- 17.6.14 The construction vibration assessment included at Chapter 8 of this PEI Report predicts that construction vibration levels for the Proposed Development will not result in any significant vibration at the residential NSRs. Consequently, no significant cumulative operational effects are anticipated to result if the construction of the STFF and the Proposed Development coincide.
- 17.6.15 Predicted effects as a result of construction vibration at the ecological NSR (Humber Estuary) and the fields to the north and south of the Site are assessed as being of minor significance provided that mitigation is applied, either by seasonally restricting drop hammer piling or using alternative piling techniques.

Operational Noise

- 17.6.16 With regards to the operation of the STFF, the noise assessment undertaken predicts operational noise to be 37 dB LAeq(t) at Poplar Farm. The highest predicted noise level from the operation of the Proposed Development at R1 (Poplar Farm) is 35 dB, resulting in a cumulative operational noise level of 39 dB LAeq. The lowest typical background noise level at Poplar Farm during the day is 48 dB LA90. With a +3 dB penalty for intermittency, the cumulative rating level from the operation of the STFF and the operation of the Proposed Development would fall below the measured background noise level resulting in an assessment of no significant cumulative operational effect.

Road Traffic

- 17.6.17 Changes in road traffic noise levels on the surrounding road network in relation to the construction and operation of the STFF were not specifically assessed in the submitted STFF ES noise chapter. However, given that the additional traffic generated is comparable to that generated by the Proposed Development (where the effect was assessed as negligible), the cumulative effect is assessed as negligible.

Engineering Works - Paragon House (Development Ref: 3)

- 17.6.18 A noise assessment was not undertaken in relation to the construction or use of the additional car parking areas at Paragon House. The ecological impact assessment undertaken considers the indirect effect of noise and vibration (at both the construction and operational phases) on designated and non-designated ecological features and on specific species. The residual effects of the proposed works on ecological receptors are considered to be not significant.
- 17.6.19 Condition 9 of permission DM/0147/16/FUL requires the submission of a Construction Management Plan (including noise mitigation measures) prior to the development commencing. There are no subsequent submissions pursuant to the planning conditions for this development available on the NELC planning webpage.
- 17.6.20 On the basis that a noise impact assessment was not required in support of this application and that the ecological assessment considered the effects of noise and vibration on ecological features in the vicinity of the site to be negligible, it is considered reasonable to conclude that the potential for significant cumulative noise or vibration effects is highly unlikely.

Road Traffic

- 17.6.21 The Transport Assessment undertaken in relation to the construction and use of the Paragon House works assesses the impact of road traffic noise as a result of the works, namely the change in road noise as a result in increases in traffic volumes. The assessment predicts that the works and use of the site will result in a predicted increase in road traffic noise at North Marsh Lane of 0.0 dB(A) and on the A1173 of 0.2 dB(A).
- 17.6.22 The increase in road traffic flows as a result of the operation of the Proposed Development has been predicted to increase $L_{A10,18hr}$ noise levels by 0.2 dB at Poplar Farm and 0.3 dB at Mauxhall Farm (to the north of the A1173).
- 17.6.23 Cumulative noise levels from changes in road traffic flows from the operation of both developments are therefore likely to result in an increase of up to 0.5 dB which is assessed as a negligible impact, resulting in a negligible adverse (not significant) effect.
- 17.6.24 It should be noted that the baseline flows used for the traffic air quality assessment of the Proposed Development include 'Committed Development' traffic flows (see Chapter 9: Traffic and Transport), so the traffic air quality assessment is inherently cumulative.

Great Coates Renewable Energy Centre (Development Ref: 8)*Construction Noise*

- 17.6.25 The noise assessment undertaken for the Great Coates Renewable Energy Centre (GCREC) includes a receptor in common with the noise assessment included at Chapter 8: Noise and Vibration of this PEI Report; R1 (Poplar Farm).
- 17.6.26 The highest construction noise level predicted at Poplar Farm as a result of the GCREC is 41 dB, which is assessed as not significant. The highest predicted noise level from the construction of the Proposed Development at Poplar Farm is 48 dB, resulting in a cumulative construction noise level of 49 dB L_{Aeq} . This is 5 dB below the measured ambient noise level resulting in an assessment of no significant cumulative operational effect should the construction of the GCREC and the Proposed Development coincide.

Construction Vibration

- 17.6.27 A construction vibration assessment was not undertaken for the GCREC. Condition 9 of permission DM/0195/17/FUL requires the submission of a detailed specification of the type of piling or foundations to be used and a scheme to mitigate effects of piling with regard to noise and vibration.
- 17.6.28 The construction vibration assessment included in Chapter 8 of this PEI Report predicts that construction vibration levels for the Proposed Development will not result in any significant vibration at the residential NSRs. Predicted effects as a result of construction vibration at the ecological NSR (Humber Estuary) and the fields to the north and south of the Site are assessed as being of minor significance provided that mitigation is applied, either by seasonally restricting drop hammer piling or using alternative piling techniques.

Operational Noise

- 17.6.29 With regards to the operation of the GCREC, the noise assessment undertaken predicts operational noise to be 29 dB $L_{Aeq}(t)$ at Poplar Farm. The highest predicted noise level from the operation of the Proposed Development at R1 (Poplar Farm) is 35 dB, resulting in a cumulative operational noise level of 36 dB L_{Aeq} . The lowest typical background noise level at Poplar Farm during the day is 48 dB L_{A90} . With a +3 dB penalty for intermittency, the cumulative rating level from the operation of the GCREC and the operation of the Proposed Development would fall below the measured

background noise level resulting in an assessment of no significant cumulative operational effect.

Road Traffic

- 17.6.30 Changes in road traffic noise in relation to the construction and operation of the GCREC were not assessed in the submitted GCREC ES (either in the Noise Assessment or the Transport Assessment).

North Beck Energy Centre (Development Ref: 10)

Construction Noise

- 17.6.31 The construction noise assessment undertaken for the proposed North Beck Energy Centre (NBEC) predicts that construction noise levels at all of the NSRs to the NBEC will result in a negligible impact, with a neutral significance of effect. As all of the NSRs to the Proposed Development are located further away from the NBEC than the NBEC NSRs, noise impacts upon the NRSS to the Proposed Development as a result of the construction of the proposed NBEC will also be negligible.
- 17.6.32 The construction noise assessment included in Chapter 8 of this PEI Report predicts that construction noise levels for the Proposed Development will result in no significant effect at the residential NSRs to the Proposed Development, with a neutral significance of effect.
- 17.6.33 During drop hammer piling works, the impact of increased noise levels at the field to the south of the Site is assessed as moderate adverse, however mitigation is proposed to reduce this effect to minor adverse as outlined above. In addition, due to the distance from the NBEC site to this field, no significant cumulative effect is anticipated.
- 17.6.34 On the basis of the above, should the construction phases of the proposed NBEC and the Proposed Development overlap then no significant cumulative construction noise effects are predicted.

Construction Vibration

- 17.6.35 The construction vibration assessment undertaken for the proposed NBEC predicts that the levels of vibration are likely to result in an impact magnitude of negligible, with a neutral significance of effect at all NSRs to the proposed NBEC.
- 17.6.36 The construction vibration assessment included at Chapter 8 of this PEI Report predicts that construction vibration levels for the Proposed Development will not result in any significant vibration at the residential NSRs. Predicted effects as a result of construction vibration at the ecological NSR (Humber Estuary) are assessed as being of minor significance, while effects on the fields to the north and south of the Site are predicted to be minor adverse during piling works provided the outlined mitigation is applied.
- 17.6.37 On the basis of the above, should the construction phases of the proposed NBEC and the Proposed Development overlap then no significant cumulative construction vibration effects are predicted.

Operational Noise

- 17.6.38 The operational noise assessment undertaken for the proposed NBEC includes an assessment of daytime and night time. The NBEC operational daytime noise assessment predicts a negligible impact at all of the NSRs to the proposed NBEC, with a neutral significance of effect. The NBEC operational night time noise assessment predicts a negligible impact all of the NSRs to the proposed NBEC, with a neutral significance of effect.

17.6.39 The operational noise assessment included at Chapter 8 of this PEI Report considers three scenarios:

- Scenario 1: worst-case hour during the day (09:00 – 10:00);
- Scenario 2: worst-case hour at night (06:00 – 07:00); and
- Scenario 3: typical one-hour at night (23:00 – 06:00).

17.6.40 The assessment predicts that operational noise levels for the Proposed Development in all three scenarios will result in a negligible impact with a negligible significance of effect at the residential NSRs. Predicted effects as a result of operational noise at the ecological NSRs (including the Humber Estuary) are also assessed as being of minor adverse or negligible significance.

17.6.41 On the basis of the above, it is predicted that the operation of the proposed NBEC and the Proposed Development would not result in a significant cumulative noise effect.

Operational Road Traffic

17.6.42 With regards to operational traffic along the A1173, an increase in road traffic noise levels of +0.1 dB $L_{A10,18h}$ is predicted as a result of the operation of the proposed NBEC. The increase in road traffic flows as a result of the operation of the Proposed Development has been predicted to increase $L_{A10,18hr}$ noise levels by 0.3 dB at Mauxhall Farm (to the north of the A1173).

17.6.43 Cumulative noise levels from changes in road traffic flows from the operation of both developments are therefore likely to result in an increase of up to 0.5 dB which is assessed as a negligible impact, with a negligible significance of effect.

17.6.44 As noted above the baseline flows used for the traffic air quality assessment of the Proposed Development include 'Committed Development' traffic flows (see Chapter 9: Traffic and Transport), so the traffic air quality assessment is inherently cumulative.

Stallingborough Interchange – Business Park (Development Ref: 11)

Construction Noise

17.6.45 The NSR to the proposed Business Park that is closest to one of the NSRs to the Proposed Development (R1 at Poplar Farm) is Location B (a residential receptor on North Moss Lane). These two locations are within 300 m of each other.

17.6.46 The noise assessment undertaken for the proposed Business Park predicts construction noise levels at North Moss Lane in the region of 49 dB L_{Aeq} . The highest predicted noise level from the construction of the Proposed Development at R1 (Poplar Farm) is 48 dB, resulting in a cumulative construction noise level of 52 dB L_{Aeq} . This is 2 dB below the measured ambient noise level.

17.6.47 It is therefore considered that the construction of the proposed Business Park at the same time as the construction of the Proposed Development would not result in a significant cumulative noise effect.

Construction Road Traffic Noise

17.6.48 The noise assessment undertaken for the proposed Business Park does not include a quantitative assessment of construction road traffic noise due to the lack of available data. The assessment predicts that the impact of construction traffic would be negligible when compared to the traffic volumes on the surrounding network and concludes that there will be no significant effect at dwellings.

- 17.6.49 As noted above the baseline flows used for the traffic air quality assessment of the Proposed Development include 'Committed Development' traffic flows (see Chapter 9: Traffic and Transport), so the traffic air quality assessment is inherently cumulative.

Construction Vibration

- 17.6.50 The construction vibration assessment undertaken for the proposed Business Park concludes that because the distance between the proposed Business Park and all of the NSRs is greater than 100 m, the level of vibration is predicted to be well below levels at which there is a risk of causing damage to buildings or disturbance to residents.
- 17.6.51 On the basis of the above, and the predicted construction vibration impacts of the Proposed Development as previously outlined, even if the construction phases of the proposed Business Park and the Proposed Development overlap, no significant cumulative construction vibration effects are predicted.

Operational Noise

- 17.6.52 The noise assessment undertaken for the proposed Business Park does not provide a quantitative assessment of operation/ use noise from the units proposed as at the time of writing specific operators/ tenants of the units were not known. NELC would require individual operators to submit noise assessments to ensure operating levels do not exceed established criteria.
- 17.6.53 With regards to the operation of the Business Park, noise from on-site HGV movements and idling HGV refrigeration units is predicted to be in the region of 43 dB L_{Aeq} at Location B (North Moss Lane). The highest predicted noise level from the operation of the Proposed Development at R1 (Poplar Farm) is 35 dB, resulting in a cumulative operational noise level of 44 dB L_{Aeq} . The lowest typical background noise level at Poplar Farm during the day is 48 dB L_{A90} . With a +3 dB penalty for intermittency, the cumulative rating level from on-site HGV movements and idle HGV refrigeration units at the proposed Business Park and the operation of the Proposed Development would fall below the measured background noise level resulting in an assessment of no significant cumulative operational effect.

Operational Road Traffic Noise

- 17.6.54 The noise assessment undertaken for the proposed Business Park predicts that the development will result in a negligible increase in road traffic noise levels within the local area and therefore no significant effects have been identified.
- 17.6.55 With regards to operational traffic along the A1173, an increase in road traffic noise levels of +0.1 dB $L_{A10,18h}$ is predicted as a result of the operation of the proposed Business Park. The increase in road traffic flows as a result of the operation of the Proposed Development has been predicted to increase $L_{A10,18hr}$ noise levels by 0.2 dB at Mauxhall Farm (to the north of the A1173).
- 17.6.56 Cumulative noise levels from changes in road traffic flows from the operation of both developments are therefore likely to result in an increase of up to 0.5 dB which is assessed as a negligible impact, with a negligible significance of effect.
- 17.6.57 As noted above the baseline flows used for the traffic air quality assessment of the Proposed Development include 'Committed Development' traffic flows (see Chapter 9: Traffic and Transport), so the traffic air quality assessment is inherently cumulative.

Cumulative Noise and Vibration Effects of All Developments

17.6.58 On the basis of the information available, the cumulative noise assessment does not identify any significant cumulative noise effects as a result of the Proposed Development and the other individual developments identified and assessed.

17.6.59 A qualitative assessment has been undertaken of the potential for significant cumulative effects on the NSRs identified for the Proposed Development as a result of all of the aforementioned developments collectively being progressed in parallel with the Proposed Development, the findings of which are summarised as follows:

- the construction noise assessment (see Chapter 8) concludes that the Proposed Development will have a negligible effect on surrounding residential receptors. Consequently, no significant cumulative noise effects from construction are predicted;
- the construction noise assessment (see Chapter 8 and Chapter 10: Ecology and Nature Conservation) concludes that there will be minor adverse (i.e. not significant) effects on surrounding ecological receptors (Humber Estuary and fields immediately to the north and south of the Site) as a result of the Proposed Development. Given the distance between the other developments in the cumulative assessment and the ecological receptors, no significant cumulative noise effects resulting from site construction are predicted;
- the construction traffic noise assessment concludes that there will be negligible effects on surrounding receptors as a result of the Proposed Development. Consequently, no significant cumulative noise effects resulting from construction traffic on public roads are predicted;
- the construction vibration assessment concludes that there will be negligible effects on surrounding residential receptors as a result of the Proposed Development. Consequently, no significant cumulative vibration effects resulting from site construction are predicted;
- the construction vibration assessment concludes that there will be minor (i.e. not significant) effects on surrounding ecological receptors (Humber Estuary and fields immediately to the north and south of the Site) as a result of the Proposed Development. Given the distance between the other developments in the cumulative assessment and the ecological receptors, no significant cumulative vibration effects resulting from site construction are predicted;
- the operational noise assessment (see Chapter 8) concludes that there will be negligible effects on surrounding residential receptors as a result of the Proposed Development. Consequently, no significant cumulative noise effects resulting from site operation are predicted;
- the operational noise assessment concludes that there will be negligible effects on surrounding ecological receptors (Humber Estuary and fields immediately to the north and south of the Site) as a result of the Proposed Development. Given the distance between the other developments in the cumulative assessment and the ecological receptors, no significant cumulative noise effects resulting from site operation are predicted ;
- the operational traffic noise assessment concludes that there will be negligible effects on surrounding receptors as a result of the Proposed Development. Consequently, no significant cumulative noise effects resulting from operational traffic on public roads; and

- the operational vibration assessment concludes that there will be negligible effects on surrounding receptors as a result of the Proposed Development. Consequently, no significant cumulative vibration effects resulting from site operation are predicted.

Cumulative Noise Assessment Summary

17.6.60 On the basis of the information available, the cumulative noise and vibration assessment does not identify any significant cumulative noise and vibration effects as a result of the Proposed Development and the other developments identified and assessed – both individually and collectively.

17.7 Cumulative Traffic and Transport Effects

17.7.1 The Transport Assessment (TA) undertaken and reported in Chapter 9 of this PEI Report incorporates other developments (defined as Committed Developments) into the assessment scenario for the future year analysis and as such the assessment presented in Chapter 9 is inherently a cumulative impact assessment.

17.7.2 The TA future year analysis includes project specific traffic data from the following developments (based on available information at the time of assessment):

- Sustainable Transport Fuels Facility (Development Ref. 2);
- Engineering works – Paragon House (Development Ref: 3);
- Renewable Power Facility – Kiln Lane (Development Ref 4);
- Waste Tyre Pyrolysis – Immingham Railfreight (Development Ref: 6);
- North Beck Energy Centre (Development Ref: 10); and
- Stallingborough Interchange - Business Park (Development Ref: 11).

17.7.3 The TA takes into account the opening of the Stallingborough Link Road (Development Ref 1) in 2022 and the associated re-distribution of traffic by undertaking sensitivity testing at key junctions within the study area (see Section 10 of Chapter 9).

17.7.4 As noted earlier in this Chapter, Development Ref: 6 (Waste Tyre Pyrolysis) and Development Ref: 9 (Waste to Energy - Immingham Railfreight) are proposed to occupy the same area (red line boundaries are around the same site). The approach adopted for the TA was therefore to ascertain which of the developments represents the worst case scenario in terms of trip generation and include that development in the assessment. The Transport Statement submitted in support of Development Ref: 6 as compared to the TA submitted in support of Development Ref: 9, shows that Development Ref: 6 would generate slightly more traffic in the AM and PM Peak hours and is therefore included in the assessment.

17.7.5 The TA future year analysis incorporates the following developments within the background growth applied to the 2018 baseline flows:

- Selvic Shipping CHP Boilers (Development Ref: 5);
- VPI Immingham Energy Park A (Development Ref 7);
- Great Coates Renewable Energy Centre (Development Ref: 8); and
- VPI Immingham OCGT DCO (Development Ref: 12).

17.7.6 The Committed Developments incorporated into the future year analysis in the TA also include some of the developments identified in the Long List (see Table 17.4) as these developments have been specifically identified as contributing to future traffic flows in the area:

- Hornsea Project One – additional area (DM/0153/17/FUL);
- Change of Use – Worldwide Way (DM/1050/16/FUL);
- Construction of access road – Land Adj Kiln Lane (DM/0717/16/FUL);
- Additional temporary construction area – Site of Wind Farm Compound (DM0153/17/FUL);
- Construction of 9 Lagoons - South Killingholme (PA/2018/155);
- River Humber Gas Pipeline Replacement Project (EN060004); and
- A180 Port of Immingham Improvement (TWA 8/1/13).

17.7.7 Chapter 9: Traffic and Transport concludes that, having taken into account the identified Committed Developments as part of the future year analysis; it is not considered that the Proposed Development will have a material impact in terms of highway capacity or safety and that the proposals represent acceptable development in highways and transport terms. There is therefore no potential for significant cumulative traffic effects.

Cumulative Traffic and Transport Assessment Summary

17.7.8 On the basis of the information available, the cumulative transport assessment does not identify any significant cumulative traffic effects as a result of the Proposed Development and the other developments identified and assessed.

17.8 Cumulative Ecology and Nature Conservation Effects

Construction

Losses of Functionally Linked Habitat

- 17.8.1 There is the potential for cumulative effects on waterbirds using functionally linked habitat surrounding the Estuary in the absence of mitigation, should multiple developments proceed that result in the loss of such habitat.
- 17.8.2 Only two of the developments considered on the cumulative effects shortlist (Table 17.5) were identified as potentially combining with the Proposed Development to result in a cumulative adverse effect through this pathway; these are the Stallingborough Link Road (Development Ref: 1) and the Sustainable Transport Fuels Facility (Development Ref: 2), which will result in the loss of waterbird habitat to the south and west of the Proposed Development. Both of these are located in North East Lincolnshire, and Policy 9 of the NELC Local Plan stipulates that for developments affecting such habitats full mitigation is provided, through a commuted sum secured via legal agreement to draw down from a dedicated strategic mitigation scheme (South Humber Gateway) being delivered directly by NELC ahead of the construction of the relevant development.
- 17.8.3 The applicant for the Stallingborough Link Road, NELC, has committed to commuting a sum of money that will draw down 6.3 ha of mitigation habitat. The applicant for the Sustainable Transport Fuels Facility also proposes to mitigate for the loss of habitat within the development site in accordance with NELC Local Plan Policy 9. With mitigation, there will therefore be no cumulative adverse effects on the Humber Estuary SPA/ Ramsar with the Proposed Development, as a result of the loss of functionally linked habitat.

Noise and Vibration Disturbance to Functionally Linked Habitats

- 17.8.4 The cumulative noise and vibration assessment (see Section 17.6 above) concludes that the construction of the Proposed Development at the same time as the construction or use of the other developments would not result in a significant cumulative noise

effect. As described above the other developers will also be committed to commuting sums of money to enable mitigation habitat to be created. With mitigation, and taking into account the proposed contribution to the South Humber Gateway strategic mitigation scheme for the Proposed Development, there is therefore no potential for cumulative adverse effects the Humber Estuary SPA/ Ramsar as a result of construction disturbance to functionally linked habitat.

Operation

Changes in Air Quality

- 17.8.5 Potentially significant cumulative effects on the Humber Estuary designated sites may occur where the cumulative PC exceeds the 1% screening threshold of the Critical Level and the Predicted Environmental Concentration (PEC) exceeds the relevant Critical Level/ Load. Unless both these criteria are exceeded, no likely significant effects on habitats within the designated sites would be predicted either because the relevant assessment threshold would not be breached, or because the other plans/ projects scoped into the cumulative effects assessment would collectively make an imperceptible contribution to emissions/ deposition.

Cumulative Emissions of Nitrogen Oxides (NO_x)

- 17.8.6 The air quality assessment has identified that the cumulative process contribution of NO_x at the nearest saltmarsh habitat to the Proposed Development (receptors E1_1, E1_2 and E1_3 in Chapter 7: Air Quality) is between 6.8 and 7.6%. This therefore exceeds the threshold for insignificance and indicates that further assessment is required.
- 17.8.7 On this basis, the total contribution from all developments to the habitat has been combined with the background concentration to determine total annual mean deposition rates. Using the background concentration from the APIS website, the cumulative PEC results in total annual mean NO_x concentrations of 31.2 – 31.4 µg/m³ at these locations, which also exceeds the Critical Level for all vegetation types from the effects of NO_x of 30 µg/m³. However, using an alternative background NO_x concentration derived from NO₂ project-specific measurement data recorded at the saltmarsh site itself (see Appendix 7A in PEI Report Volume III for details), the total PEC is between 19.9 µg/m³ and 20.1 µg/m³, which is well below the Critical Level.
- 17.8.8 An additional saltmarsh habitat receptor within the designated site (receptor E3_1) slightly exceeds the 1% process contribution threshold (1.2%), although the total PEC results in a cumulative contribution of 37.4 µg/m³. However, as the baseline levels of NO_x at this receptor are already exceeding the Critical Level (baseline level is 37.2 µg/m³), this small additional contribution is not reasonably considered to result in any adverse effects on the designated site, in combination with the other developments that have been assessed.

Cumulative Nutrient Nitrogen (N) Deposition

- 17.8.9 The air quality impact assessment has concluded that the annual N deposition rate (kg N/Ha/year) process contribution at the nearest saltmarsh habitat would be between 3.7% and 4.1% of the Critical Load at receptors E1_1, E1_2 and E1_3. As this is above the 1% insignificance screening threshold, it is therefore necessary to examine the output from the modelling in greater detail to establish whether this elevation in N deposition would result in any significant effects on the saltmarsh habitat.
- 17.8.10 The total cumulative annual N deposition predicted at these three receptors is 0.7 – 0.8 kg N/ha/yr, resulting from NO_x and ammonia (NH₃). When combined with the background deposition of 15.7 kg N/ha/yr the cumulative PEC for nitrogen deposition

will remain below the Critical Load for saltmarsh; being a maximum of 16.5 kg N/ha/yr compared to a minimum Critical Load of 20 – 30 kg N/ha/yr. This is therefore assessed as a neutral cumulative effect on the Humber Estuary SPA/ SAC/ Ramsar/ SSSI (not significant).

- 17.8.11 Moreover, it is important to note that the experimental studies that underlie conclusions regarding the sensitivity of saltmarsh to nitrogen deposition, and the selection of 20 kg N/ha/yr as the minimum Critical Load have “... *neither used very realistic N [nitrogen] doses nor input methods i.e. they have relied on a single large application more representative of agricultural discharge*” (APIS website), which is far in excess of anything that would be deposited from atmosphere. For coastal saltmarshes such as those for which Humber Estuary SAC is partly designated, nitrogen inputs from air are not as important as nitrogen effects from other sources because the effect of any deposition of nitrogen from the atmosphere is likely to be dominated by much greater flushes of more readily utilized nitrogen from marine, fluvial or agricultural sources. This is reflected on APIS itself, which states regarding saltmarsh that “*Overall, N deposition [from the atmosphere] is likely to be of low importance for these systems as the inputs are probably significantly below the large nutrient loadings from river and tidal inputs*”. In addition, the nature of intertidal saltmarsh in this area means that there is flushing by tidal incursion twice per day. This is likely to further reduce the role of nitrogen from atmosphere in controlling botanical composition.

Cumulative Acid Deposition

- 17.8.12 For acid deposition (keq/Ha/year), the air quality impact assessment identified that at the nearest sensitive receptors (sand dune habitats at E4_1, E4_2, E4_3, E4_4 and E4_5, E4_6) the cumulative process contribution would slightly exceed the 1% insignificance screening threshold for potential adverse effects on sensitive habitat types within the Humber Estuary SAC/ SPA/ Ramsar/ SSSI (predicted to be between 1.4 and 1.5%). However, given the very small process contribution resulting from these developments, it is assessed that there would be no significant effects on the Humber Estuary designated site as a result of acid deposition in combination with other plans/ projects.

Cumulative Emissions of Sulphur Dioxide (SO₂)

- 17.8.13 For SO₂, the air quality impact assessment identified that there would be exceedances of the 1% Critical Level insignificance screening threshold at receptors E1_1, E1_2 and E1_3 (nearest saltmarsh habitat) within the Humber Estuary SAC/ SPA/ Ramsar/ SSSI of 2.3 – 2.5%. However, the PEC for sulphur dioxide is not exceeded, and therefore it is concluded that there will be a neutral effect on the Humber Estuary SAC/ SPA/ Ramsar/ SSSI in combination with developments (but not including those not yet modelled as outlined in Table 17.5. This will be updated within the final ES.
- 17.8.14 As a result of the Air Dispersion Modelling used to inform the air quality assessment (see Appendix 7A in PEI Report Volume III) and the cumulative air quality assessment undertaken, it is concluded that there would be no adverse cumulative air quality effects on the Humber Estuary SAC/ SPA/ Ramsar/ SSSI.

Noise Disturbance to Functionally Linked Habitat

- 17.8.15 The cumulative noise and vibration assessment (see Section 17.6) concludes that the construction and operation of the Proposed Development at the same time as the construction or use of other developments would not result in a significant cumulative noise effect. The other developers will also be required to commit to commuting a sum of money via Local Plan Policy 9 to the South Humber Gateway strategic mitigation scheme. With this mitigation in place for other developments and the Proposed

Development (see Chapter 10), there is therefore no potential for cumulative adverse effects the Humber Estuary SPA/ Ramsar as a result of operational disturbance to functionally linked habitat.

Cumulative Ecological Assessment Summary

- 17.8.16 On the basis of the information available, the cumulative ecology assessment does not identify any significant cumulative ecology effects as a result of the Proposed Development and the other developments identified and assessed within this Chapter.

17.9 Cumulative Landscape and Visual Amenity Effects

- 17.9.1 The landscape cumulative effects assessment assesses the cumulative effects on identified landscape and visual receptors within the Study Area. Receptors that have been assessed in the landscape and visual impact assessment (see Chapter 11: Landscape and Visual Amenity) as experiencing negligible adverse effects as a result of the Proposed Development have not been included in the assessment of cumulative effects, as it is considered unlikely that the addition of negligible adverse effects would lead to a significant cumulative impact.

Cumulative Effects on Landscape Character

- 17.9.2 The other developments potentially giving rise to cumulative effects with the Proposed Development are listed in Table 17.4. They are located within Landscape Type (LT) 1: Industrial Landscape (NELC, 2015) and as such this LT is likely to experience cumulative effects. The detailed landscape cumulative assessment is contained within Table 17.6 below.
- 17.9.3 For the assessment of operational effects, the anticipated year 1 of operation has been selected as a worst case for cumulative landscape assessment (because there would be a greater amount of built development present in the landscape).
- 17.9.4 Cumulative effects on landscape character are assessed at identified landscape receptors within the 5 km Zol. Landscape receptors that have been assessed as experiencing negligible effects as a result of the Proposed Development have not been included in the assessment of cumulative effects as set out above.

Cumulative Effects on Visual Amenity

- 17.9.5 For the assessment of cumulative visual impacts the following other developments have been scoped out as a result of no intervisibility with the Proposed Development, the scale of the cumulative development (mass/ height) or distance:
- Selvic Shipping CHP Boilers (Development Ref: 5) – due to small scale of the proposed works;
 - VPI Immingham Energy Park A (Development Ref: 7) – due to distance from the Proposed Development and lack of inter-visibility; and
 - VPI Immingham OCGT DCO (Development Ref: 12) – due to distance from the Proposed Development and lack of intervisibility.
- 17.9.6 Potential cumulative visual effects of the Proposed Development in comparison with the future baseline visual context are considered in Table 17.7 to 17.13 below by reference to representative viewpoints. The assessments contained within these tables should be read in conjunction with Figures 11.6 to 11.15 (PEI Report Volume II) which illustrate the baseline conditions at each viewpoint.
- 17.9.7 Visual receptors that have been assessed as experiencing a negligible effect due to the Proposed Development have not been included in the assessment of cumulative

effects, as it is considered unlikely that the addition of a negligible effect to the cumulative effects of other developments within the study area would lead to a significant cumulative effect. This applies to Viewpoint 6: Sunk Island Footpath Public Right of Way (PRoW).

Table 17.6: Assessment of cumulative landscape effects

LANDSCAPE TYPE	NORTH EAST LINCOLNSHIRE LANDSCAPE CHARACTER ASSESSMENT 2015	Industrial Landscape: LT1
CONSTRUCTION		
Sensitivity of receptor		Low
Description of impact	Other proposed developments will introduce further construction activities within the Landscape Type (LT). These will introduce additional mobile plant including piling rigs, heavy plant machinery and cranes and require further removal of grassland and vegetation within the LT. Construction activities related to the other developments will increase the geographical extent in which construction activity occurs and the density and massing of large scale structures under construction in relation to the Proposed Development. Additional indirect effects resulting from construction traffic will occur. Due to amount of construction activity introduced, there is potential to affect the tranquillity, perceptive qualities and landscape character of the LT. Such effects will be temporary, short term and reversible but occur across a considerable proportion of the LT. The magnitude of impact on the landscape character is assessed as medium, reflecting the geographical extent of change and the introduction of uncharacteristic landscape elements required by construction.	
Predicted magnitude of impact		Medium
Classification of effect		Minor adverse (not significant)
OPERATION		
Sensitivity of receptor		Low
Description of impact	Areas of industrial and commercial land use will be extended. Some agricultural land will be lost to extended large scale car parking behind Paragon House off Kiln Lane; agricultural land off Stallingborough Interchange will be lost to the proposed Business Park; a waste to energy plant will occupy the former Immingham Railfreight Terminal site with an adjacent energy recovery facility; an Energy From Waste plant will be introduced at Vireol PLC Energy Park Way, a Sustainable Transport Fuels Facility will be located directly to the west of the Site, and a single carriageway from the Moody Lane/ Woad Lane to Hobson Way Roundabout will extend the road network within the LT. The other developments will extend the presence of large scale built form and associated hard and soft landscaping; road infrastructure; energy infrastructure including ancillary structures; hardstanding and car parking within the LT. A habitat area including storage lagoons will be introduced as part of a mitigation area. Several tall elements will be introduced by the other developments including structures of up to 90 m in height. Changes resulting from the other developments will be long term and reversible. These will occur over an area larger than the Proposed Development in isolation and as a result, will have a larger effect on landscape character. As the LT is characterised by industry and the	

LANDSCAPE TYPE	NORTH EAST LINCOLNSHIRE LANDSCAPE CHARACTER ASSESSMENT 2015	Industrial Landscape: LT1
	other developments are generally similar in nature and scale to existing developments and structures, the LT is considered to have low sensitivity to the other developments. The potential cumulative impacts on landscape character are considered to be low. Overall, due to these considerations, the cumulative effect on landscape character is regarded as minor adverse and not significant.	
Predicted magnitude of impact		Low
Classification of effect		Minor adverse (not significant)

Table 17.7: Assessment of cumulative effects on visual amenity – Viewpoint 1

VIEWPOINT 1: FARMSHOP HOTEL, A180				
Grid reference	Receptor type	Elevation (mAOD)	Distance from Site (km)	Direction of view
518804, 411844	Hotel and Business users	13.4	4.40	East-north-east
Other Developments <ul style="list-style-type: none">• Stallingborough Link Road (Development Ref: 1)• Sustainable Transport Fuels Facility (Development Ref: 2)• Renewable power facility - Kiln Lane (Development Ref: 4)• Waste Tyre Pyrolysis – Immingham Railfreight (Development Ref: 6)• Great Coates Renewable Energy Centre (Development Ref: 8)• Waste to Energy – Immingham Railfreight (Development Ref: 9)• North Beck Energy Centre (NBEC) (Development Ref: 10)• Stallingborough Interchange – Business Park (Development Ref: 11)				
CONSTRUCTION				
Visual susceptibility to change at construction	Value of view		Sensitivity of receptor	
<u>Medium.</u>	<u>Low</u>		<u>Medium</u>	
Size/ scale, duration and reversibility of impact at construction				
Medium range views of construction activities will be limited to upper level activities as a result of intervening low level vegetation. Construction activities will be visible to the front and right of the existing SHBPS in the far distance. Construction of the proposed Stallingborough Interchange Business Park will largely be screened by intervening vegetation. Construction of the stack within the Great Coates Renewable Energy Centre will be seen as separate from that related to the Proposed Development and viewed in the context of surrounding farmland extending from the near to far distance. Construction of the Sustainable Transport Fuels Facility will be visible in front of the Proposed Development, increasing visible upper level construction activities. Progressive construction of tall structures will increase their visual impact. The additional developments will result in a cumulative impact during the construction phase that due to distance and the presence of existing industrial structures is no greater than the Proposed Development assessed in isolation. The impact will be short term and reversible.				
Magnitude of impact at construction			<u>Low</u>	
Significance of effect at construction	Hotel/ Farm shop visitors		<u>Minor adverse</u> (not significant)	

OPERATION		
Visual susceptibility to change at operation	Value of view	Sensitivity of receptor
<u>Medium</u>	<u>Low</u>	<u>Medium</u>
Size/ scale, duration and reversibility of impact at operation		
Views of ground level structures will be limited by intervening vegetation. The Proposed Development and the Sustainable Transport Fuels Facility will increase the massing of structures in proximity to the existing SHBPS. The stacks associated with the Proposed Development and the additional developments will be new elements visible against the skyline. The stack at Great Coates Renewable Energy Centre will be isolated but prominent within the view. To the north, built form within the proposed Stallingborough Interchange Business Park will be largely characteristic of the existing skyline view extending south with large power lines on the horizon the north. The additional developments will result in a cumulative impact during the operation phase that due to distance and the presence of existing industrial structures in the distance is no greater than the Proposed Development assessed in isolation. Impacts will be long term and reversible.		
Magnitude of impact at operation		<u>Low</u>
Significance of effect at operation	Hotel/ Farmshop visitors	<u>Minor adverse</u> (not significant)

Table 17.8: Assessment of cumulative effects on visual amenity – Viewpoint 2

VIEWPOINT 2: BRICKFIELD HOUSE, SOUTH MARSH RD				
Grid reference	Receptor type	Elevation (mAOD)	Distance from Site (km)	Direction of view
521293, 412788	Residential	8.7	1.75	East-north-east
Other Developments <ul style="list-style-type: none">• Stallingborough Link Road (Development Ref:1)• Sustainable Transport Fuels Facility (Development Ref: 2)• Engineering Works – Paragon House (Development Ref: 3)• Great Coates Renewable Energy Centre (Development Ref: 8)				
CONSTRUCTION				
Visual susceptibility to change		Value of view		Sensitivity of receptor
<u>High</u>		<u>Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at construction				
Oblique views of ground level construction activities in the far distance within the Proposed Development, Sustainable Transport Fuels Facility, Great Coates Renewable Energy Centre and North East Lincolnshire Link Road would be limited by intervening vegetation while those in the middle ground at the mitigation area and car parking will be largely obscured by a close proximity garden boundary beech hedge. The tallest structures to be constructed will progressively become more visible from upper storey gable end window. The additional developments will result in a cumulative impact during the construction phase due to the presence of existing industrial structures within the view is no greater than the Proposed Development assessed in isolation. The impact will be short term and reversible.				
Magnitude of impact at construction				<u>Low</u>
Significance of effect at construction		Residents		Minor adverse (not significant)

OPERATION		
Visual susceptibility to change	Value of view	Sensitivity of receptor
<u>High</u>	<u>Low</u>	<u>Medium</u>
Size/ scale, duration and reversibility of impact at operation		
<p>The Proposed Development, Sustainable Transport Fuels Facility and Great Coates Renewable Energy Centre will extend the presence of industrial structures in the view. These will be largely characteristic of the type of industry locally. The extended car parking at Paragon House to the north will largely be screened by roadside planting. The Sustainable Transport Fuels Facility will screen parts of the Proposed Development. The additional developments will result in a cumulative impact during the operation phase that due to the presence of existing industrial structures within the view and the screening effects of the Sustainable Transport Fuels Facility is no greater than the Proposed Development assessed in isolation. Impacts will be long term and reversible.</p>		
Magnitude of impact at operation		<u>Low</u>
Significance of effect at operation	Residents	<u>Minor adverse (not significant)</u>

Table 17.9: Assessment of cumulative effects on visual amenity – Viewpoint 3

VIEWPOINT 3: CARR LANE PROW				
Grid reference	Receptor type	Elevation (mAOD)	Distance from Site (km)	Direction of view
521096, 412143	Footpath users	4.3	2.25	North-east
Other Developments <ul style="list-style-type: none">Stallingborough Link Road (Development Ref: 1)Sustainable Transport Fuels Facility (Development Ref: 2)Great Coates Renewable Energy Centre (Development Ref 8)				
CONSTRUCTION				
Visual susceptibility to change		Value of view		Sensitivity of receptor
<u>Medium</u>		<u>Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at construction				
Views of ground level construction activities would be limited by the A180 road embankment and associated scattered trees. Impacts would slightly increase as a result of the introduction of the stack within Great Coates Renewable Energy Centre and the structures associated with the Sustainable Transport Fuels Facility. The additional developments will result in a cumulative impact during the construction phase due to the presence of existing industrial structures within the view and the screening effects of intervening vegetation is no greater than the Proposed Development assessed in isolation. The impact will be short term and reversible.				
Magnitude of impact at construction				<u>Low</u>
Significance of effect at construction		Footpath users		<u>Minor adverse (not significant)</u>
OPERATION				
Visual susceptibility to change		Value of view		Sensitivity of receptor
<u>Medium</u>		<u>Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at operation				
Visual impacts will largely remain the same as at construction. The Proposed Development, Great Coates Renewable Energy Centre and the Sustainable Transport Fuels Facility will increase the presence of industrial elements on the skyline. The additional developments will result in a cumulative impact during the operation phase that due to the presence of existing industrial structures within the view and the screening effects of intervening vegetation is no greater than the Proposed Development assessed in isolation. Impacts will be long term and reversible.				
Magnitude of impact at operation				<u>Low</u>
Significance of effect at operation		Footpath users		<u>Minor adverse (not significant)</u>

Table 17.10: Assessment of cumulative effects on visual amenity – Viewpoint 4

VIEWPOINT 4: CRESS COTTAGE				
Grid reference	Receptor type	Elevation (mAOD)	Distance from Site (km)	Direction of view
521902, 412050	Residential	1.4	1.65	North-east
Other Developments <ul style="list-style-type: none">• Stallingborough Link Road (Development Ref: 1)• Sustainable Transport Fuels Facility (Development Ref: 2)• Engineering Works – Paragon House (Development Ref: 3)• Renewable power facility - Kiln Lane (Development Ref: 4)• Waste Tyre Pyrolysis – Immingham Railfreight (Development Ref: 6)• Great Coates Renewable Energy Centre (Development Ref: 8)• North Beck Energy Centre (NBEC) (Development Ref: 10)				
CONSTRUCTION				
Visual susceptibility to change		Value of view		Sensitivity of receptor
<u>High</u>		<u>Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at construction				
Views of low level construction activities would be screened by property boundary trees and intervening vegetation to the north east but more open to views of developments located to the north west. The additional developments will result in a cumulative impact during the construction phase that due to the presence of existing industrial structures within the view and the screening effects of intervening vegetation is no greater than the Proposed Development assessed in isolation. The impact will be short term and reversible.				
Magnitude of impact at construction				<u>Low</u>
Significance of effect at construction		Residents		<u>Minor adverse (not significant)</u>

OPERATION		
Visual susceptibility to change	Value of view	Sensitivity of receptor
<u>High</u>	<u>Low</u>	<u>Medium</u>
Size/ scale, duration and reversibility of impact at operation		
<p>The completed Proposed Development, Sustainable Transport Fuels Facility, Great Coates Renewable Energy Centre and the cluster of developments to the north-west of the property will increase the massing and size of structures within the view while increasing the dominance of industrial structures. Great Coates Renewable Energy Centre will be visually assimilated into existing structures. The additional developments will result in a cumulative impact during the operation phase that due to the presence of existing industrial structures within the view and the screening effects of intervening vegetation is no greater than the Proposed Development assessed in isolation. Impacts will be long term and reversible.</p>		
Magnitude of impact at operation		<u>Low</u>
Significance of effect at operation	Residents	<u>Minor adverse (not significant)</u>

Table 17.11: Assessment of cumulative effects on visual amenity – Viewpoint 5

VIEWPOINT 5: BEECHWOOD FARM CARVERY				
Grid reference	Receptor type	Elevation (mAOD)	Distance from Site (km)	Direction of view
523357, 411478	Inn/ Restaurant	15.3	1.85	North
Other Developments <ul style="list-style-type: none">• Stallingborough Link Road (Development Ref: 1)• Sustainable Transport Fuels Facility (Development Ref: 2)• Engineering Works – Paragon House (Development Ref: 3)• Renewable power facility - Kiln Lane (Development Ref: 4)• Waste Tyre Pyrolysis – Immingham Railfreight (Development Ref: 6)• Great Coates Renewable Energy Centre (Development Ref: 8)• North Beck Energy Centre (NBEC) (Development Ref: 10)				
CONSTRUCTION				
Visual susceptibility to change		Value of view		Sensitivity of receptor
<u>Medium</u>		<u>Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at construction				
Views of low level construction operations would be screened by the existing Lenzing Fibres buildings and intervening vegetation. Clear views of activities above this level at the Proposed Development, the Sustainable Transport Fuels Facility and Great Coates Renewable Energy Centre would be available. The additional construction activities will be readily apparent within a medium section of the view as a result of an increase of construction activities visible across the view. There will be a cumulative impact greater than the Proposed Development assessed in isolation. The impact will be short term and reversible.				
Magnitude of impact at construction				<u>Medium</u>
Significance of effect at construction		Visitors/ Customers		<u>Moderate adverse (significant)</u>

OPERATION		
Visual susceptibility to change	Value of view	Sensitivity of receptor
<u>Medium</u>	<u>Low</u>	<u>Medium</u>
Size/ scale, duration and reversibility of impact at operation		
The completed Proposed Development, Sustainable Transport Fuels Facility and Great Coates Renewable Energy Centre will increase the massing and size of structures within the view while increasing the dominance of industrial structures. Great Coates Renewable Energy Centre will be visually assimilated into existing structures. The additional developments will increase massing of structures, resulting in the appearance of a continuous visible development that will be readily apparent over a medium section of the view. There will be a cumulative impact greater than the Proposed Development assessed in isolation.		
Magnitude of impact at operation		<u>Medium</u>
Significance of effect at operation	Visitors/ Customers	<u>Moderate adverse (significant)</u>

Table 17.12: Assessment of cumulative effects on visual amenity – Viewpoint 7

VIEWPOINT 7: IMMINGHAM SOUTH, PROW				
Grid reference	Receptor type	Elevation (mAOD)	Distance from Site (km)	Direction of view
518577, 413771	Residents and footpath users	6.7	4.35	East-south-east
Other Developments <ul style="list-style-type: none">• Sustainable Transport Fuels Facility (Development Ref: 2)• Renewable power facility - Kiln Lane (Development Ref: 4)• Waste Tyre Pyrolysis – Immingham Railfreight (Development Ref: 6)• Waste to Energy – Immingham Railfreight (Development Ref: 9)• North Beck Energy Centre (NBEC) (Development Ref: 10)• Stallingborough Interchange – Business Park (Development Ref: 11)				
CONSTRUCTION				
Visual susceptibility to change		Value of view		Sensitivity of receptor
<u>Medium</u>		<u>Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at construction				
Long range views of construction will be limited to upper level activities as a result of intervening vegetation. Sustainable Transport Fuels Facility, Waste to Energy, Immingham Railfreight and North Beck Energy Centre will be the most visible developments, due to their mass, height of structures and close proximity. The views beyond to the Renewable power facility at Kiln Lane and the Waste Tyre to Energy Pyrolysis Plant will be partially screened by these developments. The additional developments will result in a cumulative impact during the construction phase due to the extent that construction activities will be visible across the view and is no greater than the Proposed Development assessed in isolation. The impact will be short term and reversible.				
Magnitude of impact at construction				<u>Low</u>
Significance of effect at construction		Residents and footpath users		<u>Minor adverse</u> (not significant)

OPERATION		
Visual susceptibility to change	Value of view	Sensitivity of receptor
<u>Medium</u>	<u>Low</u>	<u>Medium</u>
Size/ scale, duration and reversibility of impact at operation		
<p>The Proposed Development and Sustainable Transport Fuels Facility will be partially visible as separate entities to the left of the existing South Humber Bank Power Station. The Waste to Energy, Immingham Railfreight and North Beck Energy Centre developments will increase the presence of industrial elements on the skyline to the north. These developments will extend the presence of industrial structures in the view. These will be largely characteristic of the type of industry locally. The additional developments will result in a cumulative impact during the operation phase that is no greater than the Proposed Development assessed in isolation. The impact will be short term and reversible.</p>		
Magnitude of impact at operation		<u>Low</u>
Significance of effect at operation	Residents and footpath users	Minor adverse (not significant)

Table 17.13: Assessment of cumulative effects on visual amenity – Viewpoint 8

VIEWPOINT 8: MAUXHALL FARM, PROW				
Grid reference	Receptor type	Elevation (mAOD)	Distance from Site (km)	Direction of view
519177, 413200	Residents and footpath users	3.6	3.75	East
Other Developments <ul style="list-style-type: none">• Stallingborough Link Road (Development Ref: 1)• Sustainable Transport Fuels Facility (Development Ref: 2)• Engineering Works – Paragon House (Development Ref: 3)• Great Coates Renewable Energy Centre (Development Ref: 8)• Stallingborough Interchange – Business Park (Development Ref: 11)				
CONSTRUCTION				
Visual susceptibility to change		Value of view		Sensitivity of receptor
<u>Medium</u>		<u>Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at construction				
Construction activity at ground level will largely be obscured by intervening vegetation and landform. Progressive construction of the tallest structures within the Stallingborough Interchange Business Park will extend across a large proportion of the view with Engineering Works, Paragon House and the Proposed Development behind. The stack at Great Coates Renewable Energy Centre will be visible in the far distance and isolated from other development. Once construction activity associated with the Business Park commences, no views of the Proposed Development will be available. At construction the cumulative impact for receptors at this location will be as a result of the presence of the Business Park development which screens views of the Proposed Development. The impact will be short term and reversible.				
Magnitude of impact at construction				<u>Low</u>
Significance of effect at construction		Residents and footpath users	<u>Minor adverse</u> (not significant)	
OPERATION				
Visual susceptibility to change		Value of view		Sensitivity of receptor
<u>Medium</u>		<u>Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at operation				
The presence of the operational Business Park will screen views towards the Proposed Development. There will be no cumulative impact resulting from the Proposed Development and the additional developments for receptors at this location.				
Magnitude of impact at operation				<u>No cumulative effect</u>
Significance of effect at operation		Residents and footpath users	<u>No cumulative effect</u>	

Table 17.14: Assessment of cumulative effects on visual amenity – Viewpoint 9

VIEWPOINT 9: MIDDLE DRAIN PROW				
Grid reference	Receptor type	Elevation (mAOD)	Distance from Site (km)	Direction of view
522276, 413642	Footpath users	5.0	0.65	East-south-east
Other Developments <ul style="list-style-type: none">• Stallingborough Link Road (Development Ref: 1)• Sustainable Transport Fuels Facility (Development Ref: 2)• Engineering Works – Paragon House (Development Ref: 3)• Renewable power facility - Kiln Lane (Development Ref: 4)• Waste Tyre Pyrolysis – Immingham Railfreight (Development Ref: 6)• Great Coates Renewable Energy Centre (Development Ref: 8)• Waste to Energy – Immingham Railfreight (Development Ref: 9)• North Beck Energy Centre (NBEC) (Development Ref: 10)				
CONSTRUCTION				
Visual susceptibility to change		Value of view		Sensitivity of receptor
<u>Medium.</u>		<u>Low</u>		<u>Medium</u>
Size/ scale, duration and reversibility of impact at construction				
An open view of construction activities in the near to middle distance will be observed. Activities related to the Proposed Development will be seen to the immediate left of the existing SHBPS. Construction activities associated with the Sustainable Transport Fuels Facility will be clearly visible to the right of the existing SHBPS. Construction of the uppermost parts of the stack within Great Coates Renewable Energy Centre will be viewed within the context of existing industrial development. The additional construction activities will be readily apparent within a large section of the view. There will be a cumulative impact greater than the Proposed Development assessed in isolation. The impact will be short term and reversible.				
Magnitude of impact at construction				<u>High</u>
Significance of effect at construction		Footpath users		<u>Major adverse (significant)</u>

OPERATION		
Visual susceptibility to change	Value of view	Sensitivity of receptor
<u>Medium</u>	<u>Low</u>	<u>Medium</u>
Size/ scale, duration and reversibility of impact at operation		
Views of the operational developments will result in the increased presence of industrial structures across a large proportion of the skyline. The additional developments will increase the overall massing of structures within the view, although will continue to be visible as individual developments as a result of the angle of the view. The developments will be readily apparent over a large section of the view. There will be a cumulative impact greater than the Proposed Development assessed in isolation.		
Magnitude of impact at operation		<u>High</u>
Significance of effect at operation	Footpath users	<u>Major adverse (significant)</u>

Cumulative Landscape and Visual Amenity Assessment Summary

- 17.9.8 The cumulative viewpoint assessment identifies significant effects at two viewpoints, as a result of both the Proposed Development and the other identified developments that may be seen from these locations:
- 17.9.9 Viewpoint 5 (visitors and customers) would experience moderate adverse (significant) cumulative effects during construction and operation as a result of the introduction of the Sustainable Transport Fuels Facility and the Proposed Development. The effects are assessed to be greater than those assessed for the Proposed Development in isolation (see Chapter 11: Landscape and Visual Amenity). No potential mitigation has been identified.
- 17.9.10 Viewpoint 9 (footpath users) would experience major adverse (significant) cumulative effects during construction and operation as a result of the introduction of the Sustainable Transport Fuels Facility and the Proposed Development. The effects are assessed to be greater than those assessed for the Proposed Development in isolation (see Chapter 11: Landscape and Visual Amenity). Given the close proximity of the receptor, no potential mitigation has been identified.
- 17.9.11 Minor adverse cumulative effects that are not significant are predicted at Industrial Landscape LT1, Viewpoints 1, 2, 3, 4, 5, 7 and 8. These cumulative effects are generally similar to the effects of the Proposed Development in isolation and are therefore not considered to result in a significant cumulative effect.

17.10 Cumulative Geology, Hydrogeology and Land Contamination Effects

- 17.10.1 The following developments have been considered and are all anticipated to result in negligible geological, hydrogeological and land contamination effects individually:
- Stallingborough Link Road (Development Ref: 1);
 - Sustainable Transport Fuels Facility (Development Ref: 2);
 - Engineering works – Paragon House (Development Ref: 3); and
 - Great Coates Renewable Energy Centre (Development Ref: 8).

17.10.2 It is therefore considered that there is no potential for significant cumulative geological, hydrological or land contamination effects with the Proposed Development.

17.10.3 The following developments are located further than 1 km away from the Proposed Development and it is considered that there is therefore no potential for significant cumulative geological, hydrological or land contamination effects.

- Renewable power facility – Kiln Lane (Development Ref: 4);
- Shipping CHP Boilers (Development Ref: 5);
- Waste Tyres Pyrolysis – Immingham Railfreight (Development Ref: 6);
- VPI Immingham Energy Park A (Development Ref: 7);
- Waste to Energy Immingham Railfreight. (Development Ref: 9);
- North Beck Energy Centre (Development Ref: 10);
- Stallingborough Interchange – Business Park (Development Ref: 11); and
- VPI Immingham OCGT DCO (Development Ref: 12).

17.11 Cumulative Cultural Heritage Effects

17.11.1 The following two developments were given further consideration due to their proximity to the Proposed Development and the available information for each development was reviewed:

- Stallingborough Link Road (Development Ref: 1); and
- Sustainable Transport Fuels Facility (Development Ref: 2).

17.11.2 The Stallingborough Link Road scheme shares a common boundary with the Proposed Development Site boundary, and is located approximately 250 m to the south-west of the Main Development Area.

17.11.3 An aerial photograph (see Appendix 13B in PEI Report Volume III), displayed at the entrance of the existing SHBPS, shows the Main Development Area during the construction of the existing SHBPS. In this photograph the Main Development Area is shown to have been subject to a topsoil strip and appears to have been used as a laydown area and construction compound. Due to the nature of the archaeological features identified in the adjacent field, it is considered that any features extending into this area would have been disturbed by the works relating to the construction of the power station. As a consequence, there will not be any effect on archaeology, resulting in a neutral effect.

17.11.4 The application for the Stallingborough Link Road did not include a Cultural Heritage Assessment and the consultation response from the ENGIE Partnership Archaeologist (dated 28/03/2018) states that *“the potential damage to archaeological deposits by this scheme will be minimal”*. Planning permission DM/0094/18/FUL does not require the submission of any further details in relation to archaeology.

17.11.5 The application for the Sustainable Transport Fuels Facility included a Heritage ES chapter. The ES identified potential effects on the setting of several designated assets (listed buildings). The identified impacts are ‘slight adverse’ or less and therefore not significant. No effects of buried archaeology were identified.

17.11.6 On this basis it is considered that there is no potential for significant cumulative effects on archaeology arising from either the construction or the operation of the Proposed Development.

- 17.11.7 With regards to setting, cumulative impacts can arise where the above ground built elements of a development, when viewed alongside the above ground built elements of the Proposed Development, contribute to changes to setting that affect an asset's significance (importance).
- 17.11.8 The cultural heritage assessment at Chapter 13 of this PEI Report concludes that the Proposed Development will have either no impact or minimal impact on all the heritage assets identified. In all cases the residual significance of effect is either minor or negligible adverse i.e. not significant.
- 17.11.9 The location and scale of the other developments identified in the area have been assessed and it is considered that due to the existing industrial context, the Proposed Development would not result in any significant cumulative effects with them upon the setting of any designated heritage assets within the study area.

17.12 Cumulative Water Resources, Flood Risk and Drainage Effects

- 17.12.1 The majority of the other developments included on the short list (Table 17.4) have been scoped out of the water resources cumulative assessment due to the distances from the Proposed Development Site and/ or the lack of connectivity to water resource receptors.
- 17.12.2 The following three developments were given further consideration due to their proximity to the Proposed Development and the available information for each site was reviewed:
- Stallingborough Link Road (Development Ref: 1);
 - Sustainable Transport Fuels Facility (Development Ref: 2); and
 - Engineering works – Paragon House (Development Ref: 3).
- 17.12.3 All those developments are required to accord with the National Planning Policy Framework (NPPF) (Department for Communities and Local Government (MHCLG), 2019) and local drainage policies to ensure the risk of flooding from all sources does not increase. On this basis no further cumulative assessment of flood risk has been undertaken.
- 17.12.4 Potential cumulative impacts to water resources during construction processes are associated with the generation of sediments and the release into the sewer drainage network, spillage and leakages, disturbance of contaminated land, suspended sediments, and disturbance to groundwater and foul drainage.
- 17.12.5 There is also the potential that changes to water resources and drainage arrangements, as a result of the identified developments, could result in additional discharges into local water courses and changes in overall water quality. However, existing regulatory controls at both the planning and permitting (if relevant) stage would require sufficient measures to be in place during construction and operation to manage the risk of accidents and to mitigate any potential effects to an acceptable level. All developments proposing to discharge into a watercourse are required to have a discharge permit from the Environment Agency. Through the Environment Agency's permitting procedures, and in conjunction with engagement with NELC and North East Lindsey Internal Drainage Board, any issues compromising the safeguarding of water quality would be addressed at that point and monitoring controls put in place to ensure ongoing compliance. On this basis it is not considered that the construction or operation of the Proposed Development will give rise to any significant cumulative effects in conjunction with the other developments identified.

17.13 Cumulative Socio-Economics Effects

- 17.13.1 All of the developments identified will generate additional employment opportunities and associated socio-economic benefits to add to the benefits of the Proposed Development during both construction and operation.
- 17.13.2 In addition it has been assumed that all of the other developments considered constitute development that is in line with the Local Plan employment designations, which were established as part of a comprehensive development framework for the area, which would also have included the necessary housing requirements.
- 17.13.3 Whilst there might be a short-term risk of temporary labour shortage or local accommodation shortage should multiple projects progress simultaneously, the cumulative socio-economic effects of the other developments in the short list, together with the Proposed Development, are considered to be significantly beneficial overall.

17.14 Cumulative Waste Management Effects

- 17.14.1 As part of its regional planning responsibilities, NELC (the Waste Disposal Authority) has a responsibility to plan for waste management and to ensure that sufficient sites are available to provide the necessary capacity during the planning period. Further capacity may also be provided on a regional basis by waste transfers within the wider region.
- 17.14.2 Within this wider context, the effects of waste generated from the Proposed Development on the regional capacity for waste management are at such a low level that no significant cumulative effects with other developments are anticipated.

17.15 Comparison with Consented Development Cumulative Effects

- 17.15.1 The shortlist of other developments that are considered to be relevant to the cumulative effects assessment has been updated since the EIA for the Consented Development was completed, so the cumulative effects assessment presented in the Consented Development ES is not directly comparable. The main changes have been the removal of the Cress Marsh habitat mitigation scheme (which has now been completed and has no potential for cumulative effects during its operational phase) from the shortlist, and the addition of the Sustainable Transport Fuels Facility (for which a planning application was submitted to NELC in August 2019).
- 17.15.2 The cumulative effects reported in Sections 17.5 to 17.14 above would be the same as the cumulative effects of the Consented Development with the current shortlist of other developments – i.e. the Proposed Development would have no additional cumulative effects compared to the Consented Development.

17.16 Combined Effects Assessment

- 17.16.1 Combined effects are defined as those resulting from a single development, in these circumstances the Proposed Development, on any one receptor that may collectively cause a greater effect (such as the combined effects of noise and air quality/ dust impacts during construction on local residents). Mitigation of combined effects is best achieved through management and control measures to prevent the individual impacts in the first instance or reduce the impacts themselves and therefore reduce the likelihood of such interactions occurring. Table 17.15 below provides a qualitative assessment of the potential for combined effects.

Table 17.15: Potential for combined effects

POTENTIAL COMBINED EFFECT	ASSESSMENT
Combined effects of air quality, noise, traffic and visual amenity impacts on human receptors	<p><u>Construction</u></p> <p>The assessment of dust impacts on human receptors during the construction of the Proposed Development finds the residual effect to be negligible (not significant) in all cases. Noise effects at all residential receptors during construction of the Proposed Development are predicted to be negligible (not significant) and noise effects as a result of changes in road traffic levels during construction are also predicted to be negligible (not significant). Traffic related effects on roadside receptors during construction (severance, pedestrian amenity, fear and intimidation, highway safety and driver delay) are predicted to either be minor adverse (not significant) or negligible adverse (not significant). The assessment of visual impact on identified receptors finds that there will be a moderate adverse (significant) effect on users of the footpath at Viewpoint 9 (Middle Drain PRoW) during construction activities.</p> <p>On the basis of these findings and taking into account that the construction phase is short-term it is considered that human/ residential receptors will experience no significant combined effects as a result of dust, noise, road traffic and visual during the construction phase with the exception of users of the footpath at Viewpoint 9 (Middle Drain PRoW) where the visual effect in isolation is predicted to result in a moderate adverse (significant effect). It is not considered however that the combined effects considered here would alter that finding or worsen the effect.</p> <p><u>Operation</u></p> <p>The air quality assessment undertaken finds the effect of the operation of the Proposed Development on the identified human receptors to be either minor adverse (not significant) or negligible (not significant). Noise effects at all residential receptors during the operation of the Proposed Development are predicted to be negligible (not significant) and noise effects as a result of changes in road traffic levels during operation are predicted to be negligible (not significant). Traffic related effects on roadside receptors during operation (severance, pedestrian amenity, fear and intimidation, highway safety and driver delay) are predicted to either be minor adverse (not significant) or negligible adverse (not significant). The assessment of visual impact on identified receptors finds that there will be a moderate adverse (significant) effect on users of the footpath at Viewpoint 9 (Middle Drain PRoW) during the operation of the Proposed Development.</p> <p>On the basis of these findings it is considered that human/ residential receptors will experience no significant combined effects as a result of dust, noise, road traffic and visual during the operation of the Proposed Development with the exception of users of the footpath at Viewpoint 9 (Middle Drain PRoW) where the visual effect in isolation</p>

POTENTIAL COMBINED EFFECT	ASSESSMENT
	<p>is predicted to result in a moderate adverse (significant effect). It is not considered however that the combined effects considered here would alter that finding or worsen the effect.</p> <p><u>Decommissioning</u> The combined effects of decommissioning on human receptors would be similar to the combined effects reported above for construction.</p>
<p>Combined effects of air quality/ dust, noise, water quality impacts on ecological receptors</p>	<p><u>Construction</u> The ecology assessment presented in Chapter 10: Ecology considers the combined effects of noise, air quality, and water quality impacts on ecological receptors in the vicinity of the Site during construction. Potential for a significant noise effect on birds if piling is undertaken during the winter period has been identified and appropriate mitigation will be implemented (such as using Continuous Flight Auger piling techniques or applying seasonal restrictions) to reduce the effect. The loss of semi-improved grassland from the Site is also identified as a significant adverse effect, which will be mitigated by the creation of species-rich grassland within the Site to reduce the effect. No significant residual effects are identified and no significant combined effects on ecological receptors are identified.</p> <p><u>Operation</u> No significant effects or significant combined effects on ecological receptors are identified as a result of the operation of the Proposed Development.</p> <p><u>Decommissioning</u> The ecological assessment concludes that the effects of decommissioning on ecological receptors will be similar or less than the effects of construction. Pre-works surveys will be undertaken and appropriate impact avoidance or mitigation measures will be implemented as necessary.</p>

17.17 Limitations

- 17.17.1 Any limitations that were encountered during the individual assessments are detailed within each of the Chapters referenced.
- 17.17.2 The cumulative assessment is based on the currently available information on other potential or committed developments in the vicinity of the Proposed Development.

17.18 Conclusions

- 17.18.1 The assessment of cumulative effects has considered a number of other developments within the vicinity of the Site and the potential for significant cumulative effects to arise from the other identified developments together with the Proposed Development.

17.18.2 Through the consideration of the information available (at the time of assessment) it is concluded that there is the potential for the following significant residual cumulative effects:

- significant adverse cumulative visual effects at two receptor locations (Viewpoint 5: Beechwood Farm Carvery and Viewpoint 9: Middle Drain PRoW) during construction mainly due to the cumulative effect of the Sustainable Transport Fuels Facility and the Proposed Development construction phases (assuming as a worst case that they overlap); and
- significant adverse cumulative visual effects at two receptor locations (Viewpoint 5: Beechwood Farm Carvery and Viewpoint 9: Middle Drain PRoW) during operation, mainly due to the cumulative effect of the Sustainable Transport Fuels Facility and the Proposed Development.

17.18.3 As these effects are due to the scale and massing of the built form of the Sustainable Transport Fuels Facility and the Proposed Development, which is unavoidable for these types of development, no potential mitigation has been identified.

17.18.4 All other assessment topics have concluded that there is no potential for significant cumulative effects to arise as a result of the construction or operational phases of the Proposed Development when considered alongside the other identified developments.

17.18.5 The assessment of combined effects has not identified any significant combined effects where the combination of effects would result in a different rating of effect to that already predicted in the individual technical assessment.

17.19 References

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18.0 SUMMARY OF SIGNIFICANT EFFECTS

18.1 Introduction

18.1.1 Chapters 7 to 17 of this Preliminary Environmental Information (PEI) Report have considered the potential environmental impacts and effects of the Proposed Development. This chapter provides a summary of those adverse and beneficial environmental effects that are considered to be significant (i.e. moderate and major effects).

18.2 Significant Environmental Effects and Proposed Mitigation Measures

18.2.1 Table 18.1 summarises the significant environmental effects of the Proposed Development that have been identified, following implementation of the embedded mitigation or impact avoidance measures included in the design of the Proposed Development (as detailed in Chapters 7 to 17, where relevant). Table 18.1 also summarises any additional mitigation measures that have been identified in the technical assessments contained in the PEI Report. Cumulative and combined effects are included separately at the end of the table.

18.2.2 For each topic, the worst case scenario is assessed, including the worst case construction programme scenario (of the three set out in Chapter 5: Construction Programme and Management) and the worst case design parameters (the Rochdale Envelope, as set out in Chapter 4: The Proposed Development). The worst case selected for each topic assessment is described in Chapters 7 to 16).

18.2.3 Effects have been assessed for the construction, operation (including maintenance) and decommissioning scenarios.

18.2.4 As outlined in Chapter 2: Assessment Methodology, for the purposes of this EIA an effect is considered to be 'significant' if it is assessed to be moderate (adverse or beneficial) or major (adverse or beneficial). Minor and negligible effects are only referenced in this chapter where a 'significant' (moderate or major) effect has been reduced to a 'not significant' effect following mitigation.

18.2.5 To provide further clarification on the nature of the effects, each has been identified for the purposes of this summary as:

- short term (St) – effects occurring only over a short period of time, e.g. an effect that only lasts for the duration of the construction period, or one that lasts for only part of the operational phase;
- medium term (Mt) – effects occurring for the duration of the Proposed Development's operation, but which cease when operations cease; or
- long term (Lt) – effects occurring beyond the operation of the Proposed Development, for example the permanent loss of semi-improved grassland associated with the Proposed Development;
- temporary (T) – effects that are not permanent because the effect would no longer occur if the impact was removed within the relevant timescale (for example the visual amenity impact of construction structures would be described as St, T as the impact goes when the structures are removed);
- permanent (P) – effects that are permanent and cannot be readily reversed within the relevant timescale (for example an environmental feature that is lost and cannot be replaced until after decommissioning would be Mt, P. In the event that it could not be replaced at all, this would be Lt, P); and

- direct (D) – effects that result from a direct impact, for example, the loss of ecological habitat; or
- indirect (In) – also known as secondary effects, effects that result indirectly, for example, increased traffic could indirectly impact on air quality.

Table 18.1: Summary of significant effects

DEVELOPMENT STAGE	ENVIRONMENTAL IMPACT (FOLLOWING DEVELOPMENT DESIGN AND IMPACT AVOIDANCE MEASURES)	CLASSIFICATION OF EFFECT PRIOR TO MITIGATION	MITIGATION/ ENHANCEMENT (IF IDENTIFIED)	CLASSIFICATION OF RESIDUAL EFFECT AFTER MITIGATION	NATURE OF EFFECT(S) (LT/ MT/ ST AND P/ T AND D/ IN)
Chapter 7: Air Quality					
Construction	No significant effects identified				
Operation	No significant effects identified				
Decommissioning	No significant effects identified				
Chapter 8: Noise and Vibration					
Construction	(Noise from drop-hammer piling on Receptor 4 (field south of the Site) discussed in Chapter 10: Ecology and Nature Conservation summary below)	(Refer to Chapter 10: Ecology and Nature Conservation summary below)	(Refer to Chapter 10: Ecology and Nature Conservation summary below)	(Refer to Chapter 10: Ecology and Nature Conservation summary below)	(Refer to Chapter 10: Ecology and Nature Conservation summary below)
Operation	No significant effects identified				
Decommissioning	No significant effects identified				
Chapter 9: Traffic and Transport					
Construction	No significant effects identified				
Operation	No significant effects identified				
Decommissioning	No significant effects identified				
Chapter 10: Ecology					
Construction	Disturbance of waterbirds using field to south of Site due to noise/ vibration from drop-hammer piling	Moderate adverse (significant) if piling works takes place in the winter months	Commitment to implement appropriate mitigation, with flexibility as to	Minor adverse (not significant)	St/ T/ D

DEVELOPMENT STAGE	ENVIRONMENTAL IMPACT (FOLLOWING DEVELOPMENT DESIGN AND IMPACT AVOIDANCE MEASURES)	CLASSIFICATION OF EFFECT PRIOR TO MITIGATION	MITIGATION/ ENHANCEMENT (IF IDENTIFIED)	CLASSIFICATION OF RESIDUAL EFFECT AFTER MITIGATION	NATURE OF EFFECT(S) (LT/ MT/ ST AND P/ T AND D/ IN)
		(September to March inclusive)	measure/ method, but which potentially include: <ul style="list-style-type: none"> • alternative quieter piling methods e.g. Continuous Flight Auger (CFA) piling to reduce noise, which could be applied at any time of year; and/or • seasonal restrictions to avoid impacts by not using drop hammer piling for two hours either side of high tide between September and March (inclusive) 		
Construction	Loss of 6.7 ha of semi-improved grassland evaluated to be of District nature conservation value	Moderate adverse (significant)	Creation and appropriate management of 1 ha species-rich grassland within the	Minor adverse (not significant)	Lt/ P/ D

DEVELOPMENT STAGE	ENVIRONMENTAL IMPACT (FOLLOWING DEVELOPMENT DESIGN AND IMPACT AVOIDANCE MEASURES)	CLASSIFICATION OF EFFECT PRIOR TO MITIGATION	MITIGATION/ ENHANCEMENT (IF IDENTIFIED)	CLASSIFICATION OF RESIDUAL EFFECT AFTER MITIGATION	NATURE OF EFFECT(S) (LT/ MT/ ST AND P/ T AND D/ IN)
			Site with higher ecological value than the habitat lost		
Operation	No significant effects identified				
Decommissioning	No significant effects identified				
Chapter 11: Landscape and Visual Amenity					
Construction	Impact on visual amenity footpath users at Viewpoint 9 during construction activities	Moderate adverse (significant)	None	Moderate adverse (significant)	St/ T/ D
Operation	Impact on visual amenity footpath users at Viewpoint 9 during operation	Moderate adverse (significant)	None	Moderate adverse (significant)	Mt/ P/ D
Decommissioning	Impact on visual amenity footpath users at Viewpoint 9 during decommissioning activities	Moderate adverse (significant)	None	Moderate adverse (significant)	St/ P/ D
Chapter 12: Geology, Hydrology and Contaminated Land					
Construction	No significant effects identified				
Operation	No significant effects identified				
Decommissioning	No significant effects identified				
Chapter 13: Cultural Heritage					
Construction	No significant effects identified				
Operation	No significant effects identified				
Decommissioning	No significant effects identified				

DEVELOPMENT STAGE	ENVIRONMENTAL IMPACT (FOLLOWING DEVELOPMENT DESIGN AND IMPACT AVOIDANCE MEASURES)	CLASSIFICATION OF EFFECT PRIOR TO MITIGATION	MITIGATION/ ENHANCEMENT (IF IDENTIFIED)	CLASSIFICATION OF RESIDUAL EFFECT AFTER MITIGATION	NATURE OF EFFECT(S) (LT/ MT/ ST AND P/ T AND D/ IN)
Chapter 14: Water Resources, Flood Risk and Drainage					
Construction	Change to the impermeable area within the Site, and associated changes to surface water flows resulting in adverse effects on flood risk and drainage	Moderate adverse (significant)	Directing runoff to an attenuation pond with controlled outfall, to limit discharge into the drainage network to greenfield rates	Minor adverse (not significant)	St/ T/ D
Operation	Change to the impermeable area within the Site, and associated changes to surface water flows resulting in adverse effects on flood risk and drainage	Moderate adverse (significant)	Directing runoff to an attenuation pond with controlled outfall, to limit discharge into the drainage network to greenfield rates	Minor adverse (not significant)	Mt/ T/ D
Decommissioning	No significant effects identified				
Chapter 15: Socio-Economics					
Construction	Net employment generated during construction.	Major beneficial (significant)	None required but a careers fair and Meet the Buyer event will be held to improve opportunities for local residents and businesses	Major beneficial (significant)	St/ P/ D
Operation	Net employment generated during operation.	Moderate beneficial (significant)	None required but a careers fair and Meet the Buyer	Moderate beneficial (significant)	Mt/ P/ D

DEVELOPMENT STAGE	ENVIRONMENTAL IMPACT (FOLLOWING DEVELOPMENT DESIGN AND IMPACT AVOIDANCE MEASURES)	CLASSIFICATION OF EFFECT PRIOR TO MITIGATION	MITIGATION/ ENHANCEMENT (IF IDENTIFIED)	CLASSIFICATION OF RESIDUAL EFFECT AFTER MITIGATION	NATURE OF EFFECT(S) (LT/ MT/ ST AND P/ T AND D/ IN)
			event will be held to improve opportunities for local residents and businesses		
Decommissioning	No significant effects identified				
Chapter 16: Waste Management					
Construction	No significant effects identified				
Operation	No significant effects identified				
Decommissioning	No significant effects identified				
Chapter 17: Cumulative and Combined Effects					
Construction	Cumulative impact on visual amenity for visitors/ customers to Viewpoint 5: Beechwood Farm Carvery during construction of Proposed Development and Sustainable Transport Fuels Facility	Moderate adverse (significant)	None	Moderate adverse (significant)	St/ T/ D
Construction	Cumulative impact on visual amenity for visitors/ customers to Viewpoint 9: Middle Drain Public Right of Way (PRoW) during construction of Proposed Development and Sustainable Transport Fuels	Major adverse (significant)	None	Major adverse (significant)	St/ T/ D

DEVELOPMENT STAGE	ENVIRONMENTAL IMPACT (FOLLOWING DEVELOPMENT DESIGN AND IMPACT AVOIDANCE MEASURES)	CLASSIFICATION OF EFFECT PRIOR TO MITIGATION	MITIGATION/ ENHANCEMENT (IF IDENTIFIED)	CLASSIFICATION OF RESIDUAL EFFECT AFTER MITIGATION	NATURE OF EFFECT(S) (LT/ MT/ ST AND P/ T AND D/ IN)
	Facility				
Operation	amenity for visitors/ customers to Viewpoint 5: Beechwood Farm Carvery during operation of Proposed Development and Sustainable Transport Fuels Facility	Moderate adverse (significant)	None	Moderate adverse (significant)	Mt/ P/ D
Operation	Cumulative impact on visual amenity footpath users remains at Viewpoint 9 during operation of Proposed Development and Sustainable Transport Fuels Facility	Major adverse (significant)	None	Major adverse (significant)	Mt/ P/ D

Note: Lt = long term, Mt = medium term, St = short term, P = permanent, T = temporary, D = direct and In = indirect.

18.3 **Comparison of Proposed Development and Consented Development Effects**

- 18.3.1 The assessments presented in Chapters 7 to 17 each included a comparison of the effects of the Proposed Development against a future baseline with the Consented Development, in order to identify any additional effects arising from the Proposed Development. No significant effects have been identified as arising from the Proposed Development in this scenario, due to the similarities between the Consented and Proposed Developments.