CONTENTS

TABLES

19.0 SUSTAINABILITY AND CLIMATE CHANGE

19.1 Introduction

19.1.1 This chapter of the Environmental Statement (ES) addresses the potential effects of the Proposed Development on sustainability and climate change.

19.1.2 As recognised in the National Policy Statement (NPS) for Renewable Energy Infrastructure (NPS EN-3, DECC, 2011c) the Proposed Development is a renewable energy project, because it will use waste that would otherwise be disposed of lower down the waste hierarchy (see the Fuel Availability and Waste Hierarchy Assessment (Document Ref. 5.7)) to generate energy. The need for the Proposed Development is discussed further in Chapter 6: Need, Alternatives and Design Evolution and in the Planning, Design and Access Statement (Document Ref. 5.5).

19.1.3 This chapter:

- provides a summary of relevant national and local policy and guidance;
- signposts relevant information relating to sustainability and climate change that is contained in other technical chapters of the ES (Chapter 9: Traffic and Transport, Chapter 10: Ecology, Chapter 14: Water Resources, Flood Risk and Drainage , Chapter 15: Socio Economics and Chapter 16: Waste Management);
- summarises the findings of the greenhouse gas emissions (GHGs) assessment contained in Appendix 19A in ES Volume III (Document Ref. 6.4);
- considers other potential climate change impacts on the Proposed Development due to changes in rainfall, temperature and extreme weather events; and
- considers potential combined effects on sensitive receptors from climate change and the Proposed Development.

19.2 Legislation and Planning Policy Context

Climate Change Act 2008

19.2.1 The Climate Change Act 2008 sets a legally binding target for the UK to reduce its GHGs from 1990 levels by at least 80% by 2050. This overall target is supported by a system of binding five-year 'carbon budgets' as well as an independent body to monitor progress, the Committee on Climate Change.

Climate Change Act 2008 (2050 Target Amendment) Order 2019

19.2.2 Further to the target described in paragraph 19.2.1 above, the UK has subsequently committed to reducing GHGs by 100% by 2050 compared to 1990 levels, i.e. achieve net zero GHG emissions through the Climate Change Act 2008 (2050 Target Amendment) Order 2019. This revises the previous 2050 GHGs target of an 80% reduction of GHGs compared to 1990 levels.

19.2.3 The systems set up by the Climate Change Act 2008 remain, including a system of binding five-year 'carbon budgets' as well as an independent body to monitor

progress, the Committee on Climate Change. Achieving the new net zero target by 2050 will require future GHGs to be aligned (avoided or offset) with any future new or revised carbon budgets that may be set out by Government.

The Carbon Budgets Orders

19.2.4 The UK carbon budgets restrict the amount of GHGs the UK can legally emit in a defined five-year period. The Carbon Budgets Orders set five-yearly carbon budgets. The UK Government declared the fifth carbon budget for 2028 – 2032 in the Carbon Budget Order 2016.

19.2.5 As a result of the amended 2050 carbon reduction target to net zero carbon, the Committee on Climate Change announced it will review the current carbon budgets. The sixth carbon budget will be published later in 2020. The Committee on Climate Change recently stated that, *"[It]… will revise its assessment of the appropriate path for emissions over the period to 2050 as part of its advice next year (2020) on the sixth carbon budget*" (Committee on Climate Change, 2019).

19.2.6 Whilst some tightening of the current carbon budgets is likely to occur when they are reviewed and revised in 2020, to reflect the recent commitment to a net zero carbon economy by 2050, the Committee on Climate Change has indicated that the trajectory will be steeper over time; therefore it is the later carbon budgets rather than near term ones which will see a greater change.

19.2.7 The carbon budgets have been considered when determining the significance of GHGs from the Proposed Development.

Energy Bill and Electricity Market Reform

19.2.8 The aim of the Energy Bill and Electricity Market Reform (EMR) are to secure supply, keep energy affordable and to decarbonise energy generation. Stage 3 of the EMR (2020s) focuses on the development of low-carbon technologies across the energy sector to help meet 2050 net zero commitments.

19.2.9 The Emissions Performance Standard (EPS) states that carbon emissions associated with power generation should be limited to 450 g/kWh – the EPS will be reviewed on a 3-years basis.

National Policy Statements for Energy

19.2.10 The Overarching National Policy Statement (NPS) for Energy EN-1 (DECC, 2011b) emphasises the importance of a diverse mix of energy generating technologies. The NPS states that the Government is committed to increasing the use of renewable energy and investment in low carbon energy generation to ensure a secure electricity market in the future.

19.2.11 The NPS states that the CO_2 emissions of individual applications do not need to be benchmarked against UK carbon budgets, and CO_2 emissions are not a reason to prevent project consent. However, as the chapter is provided to comply with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2018, a GHG assessment is included, as part of the overall consideration of sustainability and climate change impacts.

19.2.12 The NPS for Renewable Energy Infrastructure EN-3 (DECC, 2011c) covers energy from waste. It states:

"The recovery of energy from the combustion of waste, where in accordance with the waste hierarchy, will play an increasingly important role in meeting the UK's energy needs. Where the waste burned is deemed renewable, this can also contribute to meeting the UK's renewable energy targets. Further, the recovery of energy from the combustion of waste forms an important element of waste management strategies in both England and Wales."

19.2.13 The Proposed Development's compliance with the waste hierarchy is set out in the Fuel Availability and Waste Hierarchy Assessment (Document Ref. 5.7).

National Planning Policy on Waste

19.2.14 The National Planning Policy for Waste (Department for Communities and Local Government, 2014) sets out the Government's waste planning policies for England and now these are applied. It is the responsibility of local authorities to identify opportunities for new/ enhanced waste management facilities, within their Local Plans.

Department for Environment, Food and Rural Affairs (Defra) Waste Strategy

19.2.15 The focus of Defra's Our Waste, Our Resources: A Strategy for England (Defra, 2018) is to maximise the value of resource use, and to minimise waste and its impact on the environment. Chapter 3 of the Strategy, entitled 'Recovering Resources and Managing Waste', states a target for *"65% of municipal waste by weight to be recycled by 2035, with no more than 10% ending up in landfill"* and identifies the role of energy from waste plants in achieving this goal. The Strategy encourages further investments in energy from waste plants to meet waste projections.

National Planning Policy Framework

19.2.16 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2019a) sets out the Government's planning policies for England and how these are expected to be applied. Of most relevance to this chapter are policies regarding achieving sustainable development and meeting the challenge of climate change, flooding and coastal change. Section 2 of the NPPF focuses on achieving sustainable development, across three overarching objectives; economic, social and environmental. Section 14 provides details on meeting the challenge of climate change, flooding and coastal change.

National Planning Policy Guidance

19.2.17 The National Planning Policy Guidance on Climate Change published by the Ministry of Housing, Communities and Local Government (2019b) describes how to identify suitable mitigation and climate adaptation measures to incorporate into the planning process. It states "*effective spatial planning is an important part of a successful response to climate change as it can influence the emission of greenhouse gases… Planning can also help increase resilience to climate change impact through the location, mix and design of development."*

Local Planning Policy

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

19.2.19 The Plan outlines that The Humber Estuary is promoted as "*the UK's energy estuary and particularly as a focus for renewable energy*" and that "*the presence of the port, combined with the Borough's infrastructure network associated with a long history of industry and energy production provides excellent foundations for a range of onshore renewable energy technologies to continue to be developed*".

19.2.20 Policy S02 Climate Change seeks to:

> *"Address the causes and effects of climate change by promoting development that minimises natural resources and energy use; reduces waste and encourage recycling; reduces pollution; brings about opportunities for sustainable transport use; responds to increasing flood risk; and, incorporates sustainable construction practices. Promote appropriate distribution of development and the role of green infrastructure in mitigating aspects of flood risk. Recognise the increased stress on habitats and species that climate change causes."*

19.3 Assessment Methodology and Significance Criteria

Impact Assessment and Significance Criteria

19.3.1 There is no standard methodology for assessing the magnitude of sustainability and climate change impacts and significance of effects of proposed developments. Each project is evaluated according to its individual characteristics.

19.3.2 The methodologies for assessing most of the relevant sustainability and climate change considerations are described within the relevant technical chapters of the ES (Chapter 9: Traffic and Transport, Chapter 10: Ecology, Chapter 14: Water Resources, Flood Risk and Drainage, Chapter 15: Socio-Economics, and Chapter 16: Waste Management).

19.3.3 The assessment of the resilience of the Proposed Development to other climate change impacts has been undertaken with reference to published climate change data and forecasts (Met Office, 2019, 2020a and 2020b).

19.3.4 The methodology for the GHGs assessment is described in Appendix 19A (ES Volume III, Document Ref. 6.4).

19.3.5 In addition to the potential impacts from climate change on the Proposed Development (such as flood risk) and the impacts of the Proposed Development on climate change (i.e. GHGs), consideration has also been given to in-combination climate impacts on sensitive receptors (i.e. combined effects due to climate change and the Proposed Development). This assessment is qualitative, using professional judgment and information from the relevant technical chapters of the ES.

Extent of Study Area and Sources of Information

19.3.6 Specific details regarding the study areas, receptors and sources of information for each of the topics considered in relation to sustainability and climate change are outlined within the relevant technical chapters (Chapter 9: Traffic and Transport, Chapter 10: Ecology, Chapter 14: Water Resources, Flood Risk and Drainage, Chapter 15: Socio-Economics, and Chapter 16: Waste Management).

19.3.7 The GHGs assessment study area includes all GHGs from within the Main Development Area arising during all stages of the construction, operation and decommissioning of the Proposed Development. It also includes emissions arising from offsite activities which are directly related to the Proposed Development, such as transport, treatment of materials and waste disposal.

19.3.8 Sources of information for the GHGs assessment are set out in Appendix 19A (ES Volume III, Document Ref. 6.4).

19.3.9 Information on the existing climate and future predicted climate changes at the Site has been sourced from Met Office data (2019, 2020a and 2020b).

Consultation

19.3.10 A summary of the consultation responses received are presented in Table 19.1 below.

Table 19.1: Consultation summary and responses

CONSULTEE/ DATE	SUMMARY	RESPONSE
Planning Inspectorate (October 2019), Scoping Opinion	Section 3.3.15 Climate and Climate Change. The ES should include a description and assessment (where relevant) of the likely significant effects the Proposed Development has on climate (for example having regard to the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change. Where relevant, the ES should describe and assess the adaptive capacity that has been incorporated into the design of the Proposed Development. This may include, for example, alternative measures such as changes in the use of materials or construction and design techniques that will be more resilient to risks from climate change"	The likely significant effects of the Proposed Development on climate change, the vulnerability of the Proposed Development to climate change impacts, and the adaptive capacity of the Proposed Development design to climate change impacts is outlined within Section 19.7 of this chapter.
	Section 4.1 Air Quality	The GHGs assessment is

CONSULTEE/ DATE	SUMMARY	RESPONSE
	The ES should assess the impacts of all greenhouse gas emissions over the lifetime of the Proposed Development where these are likely to lead to significant environmental effects.	presented in Appendix 19A (ES Volume III, Document Ref. 6.4).
	Section 4.12 Non-significant Environmental Issues The Scoping Report states that sustainability and climate change matters will be reported in the appropriate chapters in the ES, with the main considerations being increased flood risk linked to climate change, carbon dioxide emissions and the generation of renewable energy. The Inspectorate agrees with this approach but advises that the ES should clearly signpost the sections of the relevant chapters which are dealing with climate and climate change. The Applicant is referred to the advice given in section 3 and Table 4.1 of this Opinion".	This chapter provides a summary of the impacts of climate change on the Proposed Development, the impacts of the Proposed Development and the in-combination effects of the Proposed Development and climate change as well as including sign posting to further information in the relevant technical chapters.

19.3.11 For each of the other technical assessments that are relevant to sustainability or climate change impacts, consultation has been undertaken with the relevant consultees, and the findings of the EIA Scoping Opinion and Section 42 consultation on the PEI Report has informed the assessments.

19.3.12 The consultation outcomes are set out in each of these chapters (Chapter 9: Traffic and Transport, Chapter 10: Ecology, Chapter 14: Water Resources, Flood Risk and Drainage, Chapter 15: Socio-Economics, and Chapter 16: Waste Management).

Summary of Key Changes to Chapter 19 Since Publication of the Preliminary Environmental Information (PEI) Report

19.3.13 The PEI Report was published for statutory consultation in November 2019, allowing consultees the opportunity to provide informed comment on the Proposed Development, the assessment process and preliminary findings through a consultation process prior to the finalisation of this ES.

19.3.14 The PEI Report did not include a Sustainability and Climate Change chapter but Chapter 2: Assessment Methodology stated that a GHGs assessment and Sustainability and Climate Change signposting chapter would be included in the final ES.

19.3.15 The key changes since the PEI Report was published relevant to this Chapter are summarised in Table 19.2 below.

Table 19.2: Summary of Key changes since Preliminary Environmental Information

SUMMARY OF CHANGE SINCE PEI REPORT	REASON FOR CHANGE	SUMMARY OF CHANGE TO CHAPTER TEXT IN THE ES
This Chapter and its supporting Appendix 19A (GHGs Assessment) have been prepared.	GHGs Assessment completed. Chapter prepared in response to PINS' Scoping Opinion.	Sustainability and Climate Change chapter now added, with GHGs Assessment included at Appendix 19A (ES Volume III, Document Ref. 6.4).

19.4 Baseline Conditions

Existing Baseline

19.4.1 A description of the existing Site is provided in Chapter 3: Description of the Proposed Development Site.

19.4.2 Existing baseline conditions relevant to transport, biodiversity, flood risk, drainage, socio-economics and waste management are described in Chapter 9: Traffic and Transport, Chapter 10: Ecology, Chapter 14: Water Resources, Flood Risk and Drainage, Chapter 15: Socio-Economics, and Chapter 16: Waste Management.

19.4.3 The baseline for the GHG assessment (refer to Appendix 19A ES Volume III) is a 'Do Nothing' scenario which is an assumed scenario where the Consented and/ or Proposed Developments are not progressed. The baseline comprises existing carbon stock and sources of GHGs within the boundary of the Main Development Area.

19.4.4 Data on the current climate at the location of the Site has been obtained to inform consideration of potential climate change impacts on the Proposed Development. Met Office historic climate data has been obtained from the Cleethorpes Climate Station (the closest climate station to the Site) for the period 1981-2010 (The Met Office, 2020a). These are presented in Table 19.3.

Table 19.3: Historic Climate Data (from Cleethorpes) (Met Office, 2020a)

CLIMATIC VARIABLE	MONTH	VALUE
Average annual maximum daily temperature (°C)	-	13.6
Warmest month on average (°C)	July and August	20.7
Coldest month on average (°C)	January	1.7
Mean annual rainfall levels (mm)	-	587.9
Wettest month on average (mm)	November	60.2
Driest month on average (mm)	February	38.0

19.4.1 The Met Office historic 10-year averages for the East and North East of England identify gradual warming between 1970 and 2019, also with increased rainfall (The Met Office, 2020b). Information on mean maximum annual temperatures (°C) and mean annual rainfall (mm) is summarised in Table 19.4 below.

Table 19.4: Historic 10-year Averages for Temperature and Rainfall for the East and North East England

CLIMATIC VARIABLE	CLIMATE VARIABLE	
	Mean maximum annual temperatures (°C)	**Mean annual rainfall (mm)**
1970-1979	12.0	698.2
1980-1989	12.0	748.2
1990-1999	12.7	720.2
2000-2009	13.2	824.9
2010-2019	13.1	796.2

Future Baseline

19.4.2 Future baseline conditions relevant to transport, biodiversity, flood risk, drainage, socio-economics and waste management are described in Chapter 9: Traffic and Transport, Chapter 10: Ecology, Chapter 14: Water Resources, Flood Risk and Drainage, Chapter 15: Socio-Economics, and Chapter 16: Waste Management.

19.4.3 Climate change has the potential to impact on the future baseline conditions; for example, increased incidences of heavy and prolonged rainfall could increase flood risk from surface water, groundwater and drainage systems.

19.4.4 The future climate baseline is expected to differ from the present-day baseline. UK Climate Projections 2018 (UKCP18) have been developed by the UK Climate Impacts Programme (UKCIP) (The Met Office, 2019) to provide projections for future climate scenarios and trends. The UKCP18 data is the most robust source of information on the UK's future climate.

19.4.5 UKCP18 provides probabilistic projections for pre-defined 20-year time periods (for example 2020-2039, 2040-2059, 2060-2079, and 2080-2099). For the purpose of the Proposed Development, UKCP18 projections for the following climate variables have been obtained:

- mean annual temperature;
- mean summer temperature;
- mean winter temperature;
- maximum summer temperature;
- minimum winter temperature;
- mean annual precipitation;
- mean summer precipitation; and
- mean winter precipitation.

19.4.6 UKCP18 allows for future climate projections across a range of probability levels to be assessed, ranging from 10% probability to 90% probability:

- 10% probability level – this demonstrates what the future change is unlikely to be less than. There is a 90% chance the projected change will be more than this.
- 50% probability level – this is known as the central estimate, with an even chance of it occurring and not occurring.
- 90% probability level – this demonstrates what the future change is unlikely to be more than. There is a 10% chance the projected change will be more than this.

19.4.7 Projected temperature and precipitation variables (The Met Office, 2019) are presented in Table 19.5 and 19.6 below.

Table 19.5: Projected Changes in Temperature Variables (°C), 50% Probability (10% and 90% probability in parenthesis)

CLIMATE VARIABLE	TIME PERIOD		
	2020-2039	2030-2049	2050-2069
Mean annual air temperature anomaly* at 1.5 m (°C)	+1.0 (+0.3 to +1.6)	+1.3 (+0.6 to +2.1	+2.1 (+1.0 to +3.3)
Mean summer air temperature anomaly at 1.5 m (°C)	+1.1 (+0.4 to +2.0)	+1.5 (+0.4 to +2.6)	+2.5 (+0.9 to +4.2)
Mean winter air temperature anomaly at 1.5 m (°C)	+0.9 (0.0 to +1.9)	+1.3 (+0.1 to +2.5)	+2.0 (+0.5 to +3.5)
Maximum summer air temperature anomaly at 1.5 m (°C)	+1.2 (+0.2 to +2.3)	+1.6 (+0.4 to +2.9)	+2.8 (+0.8 to +4.9)
Minimum winter air temperature anomaly at 1.5 m (°C)	+0.9 (-0.1 to +1.9)	+1.2 (-0.0 to +2.6)	+2.0 (+0.5 to +3.6)

*anomaly= is the difference from an average, or baseline, temperature.

Table 19.6: Projected Changes in Precipitation Variables (%), 50% Probability (10% and 90% probability in parenthesis)

CLIMATE VARIABLE	TIME PERIOD		
	2020-2039	2030-2049	2050-2069
Annual precipitation rate anomaly (%)	+2.1 (-3.0 to +7.4)	-0.1 (-5.0 to +5.1)	-0.1 (-7.7 to +6.4)
Summer precipitation rate anomaly (%)	-4.5 (-23.7 to +15.5)	-8.8 (-28.9 to +11.3)	-18.8 (-44.6 to +7.7)
Winter precipitation rate anomaly (%)	+4.3 (-5.2 to +14.8)	+5.2 (-4.8 to +15.8)	+10.3 (-5.0 to +26.9)

Table 19.7: Projected 50% probability of sea level rise under RCP 8.5* relative to the 1981-2000 baseline period (10% and 90% probability in parenthesis)

CLIMATE VARIABLE	2026	2029	2059
Sea level anomaly (m)	+0.13 (+0.10 to +0.16)	+0.11 (+0.14 to +0.18)	+0.36 (+0.27 to +0.46)

*'Representative Concentration Pathway (RCP) 8.5' is a modelled GHG concentration scenario with high GHGs, adopted by the International Panel on Climate Change

19.4.8 The UKCP18 climate projections show a mean annual, summer and winter air temperature anomaly increase each two decade period between 2020 and 2069. The annual precipitation rate anomaly is expected to increase in the next two decades and then decrease marginally between 2030 and 2069 with a decreasing summer rate and increasing winter rate between 2020 and 2069. Sea levels are expected to rise between 2020 and 2069.

19.4.9 UKCP18 climate change projections have been used qualitatively to identify how events associated with climatic variables change over time. Baseline climatic conditions (as identified through Met Office datasets) can subsequently be compared against climate change projections to indicate the direction and degree of change. This approach allows these events to be prioritised over the duration of the Proposed Development and to enable the identification of any mitigation and adaptation responses.

19.5 Development Design and Impact Avoidance

19.5.1 The Transport Assessment at Appendix 9A (ES Volume III, Document Ref. 6.4) includes management plans for construction and operational staff vehicles and HGVs to reduce traffic movements and define designated HGV routes avoiding sensitive receptors.

19.5.2 The ecological assessment presented in Chapter 10: Ecology describe how impacts on biodiversity will be avoided. These include a financial contribution towards strategic mitigation habitat creation in accordance with local policy, a minimum 5 m undeveloped buffer zone along the banks of all perimeter ditches for avoid disturbing water vole (with the exception of a new site access which will cross the northern perimeter ditch), and measures to prevent pollution and minimise light spill during construction and operation.

19.5.3 The Combined Heat and Power (CHP) Assessment (Document Ref. 5.6) sets out the potential opportunities for the Proposed Development to provide heat and/ or power for local industrial users and how the plant will be CHP-ready.

19.5.4 The assessment of waste in Chapter 16: Waste Management describes how waste will be reduced and managed in accordance with the waste hierarchy during the construction, operation (including maintenance) and decommissioning of the Proposed Development.

19.5.5 The reduction of waste during construction, initiatives to reduce traffic, and design of the Proposed Development to minimise the scale of the buildings without affecting safety or functionality, will reduce GHGs associated with the construction phase.

19.6 Likely Impacts and Effects

19.6.1 This section signposts and summarises assessments presented elsewhere in the ES and considers other potential climate change impacts on the Proposed Development. The potential sustainability and climate change impacts are summarised as follows:

- traffic generation (and associated GHGs);
- loss of biodiversity;

- increased flood risk (due to climate change and/ or the Proposed Development, or both);
- employment generation;
- potential for supply of heat and/ or power to local industrial users;
- waste generation;
- GHGs from construction, operation and decommissioning of the Proposed Development;
- other impacts of climate change on the Proposed Development (rainfall and temperature); and
- combined impacts from climate change and the Proposed Development on sensitive receptors.

19.6.2 These impacts are discussed in turn below.

Traffic Generation

19.6.3 Policy supports the use of sustainable modes of transport, which have lower carbon emissions as well as reduced used of transport in general.

19.6.4 The transport assessment presented in Chapter 9: Traffic and Transport provides information on the traffic impacts during construction, operation and decommissioning of the Proposed Development. No significant adverse effects are identified.

19.6.5 The majority of traffic movements are associated with fuel delivery to the Site. Fuel is expected to be delivered to the Site by road, as the Site is not connected by rail or water. Opportunities to use nearby rail facilities will be considered during fuel contract negotiations.

19.6.6 GHGs associated with transport during construction and operation of the Proposed Development are assessed in the GHG assessment (Appendix 19A, ES Volume III, Document Ref. 6.4) and discussed further at paragraphs 19.6.22 to 19.6.26 below.

Loss of Biodiversity

19.6.7 The ecological assessment presented in Chapter 10: Ecology describes the impacts and effects of the Proposed Development on habitats and species.

19.6.8 The Main Development Area currently comprises mainly semi-improved grassland supporting a range of species, which will be lost as a result of the Proposed Development. However, as mitigation will be provided in the form of new and enhanced habitats elsewhere on the Site, and a substantial financial contribution in accordance with local policy to fund the creation of new wetland bird habitat off Site, no significant adverse effects are identified.

Increased Flood Risk

19.6.9 Chapter 14: Water Resources, Flood Risk and Drainage describes the impacts and effects of the Proposed Development in terms of flood risk and drainage.

19.6.10 Flood risk assessments are required to take the impacts of climate change into account. The NPPF requires 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.

19.6.11 The Site is located close to the Humber Estuary but is protected by existing tidal flood defences. In future climate change scenarios, with sea level rise, there is an increased flood risk at the Site from those defences overtopping or being breached during an extreme rainfall event.

19.6.12 In accordance with the recommendations made by the Environment Agency during consultation, a range of mitigation measures will therefore be implemented including providing a place of safe refuge within the Proposed Development, raising up or protecting critical equipment from flooding, developing a Flood Emergency Response Plan, and incorporating flood resistance and resilience measures into the Proposed Development design.

19.6.13 The Proposed Development will not cause any change to flood risk off Site, as it is not located within functional floodplain and the surface water drainage system will discharge from the Site at greenfield runoff rate (i.e. no change to the existing situation).

Employment Generation

19.6.14 Chapter 15: Socio-Economics sets out the assessment of impacts and effects of the Proposed Development on local people and the economy.

19.6.15 The Proposed Development will have a positive economic effect on the local area through the provision of employment and associated indirect and induced effects (e.g. supply chain), with significant beneficial effects on employment during the construction and operational phases. The Proposed Development will generate long-term jobs once operational including a number of highly skilled roles, therefore helping to support a more sustainable economy.

Potential for Heat and/ or Power Supply to Local Industrial Users

19.6.16 The Proposed Development will be designed to be CHP ready, so heat and/ or power could be supplied to local industrial sites in the future. This would provide carbon savings as heat from the Proposed Development could be reused by other local developments, reducing the need for grid electricity or gas.

Waste Generation

19.6.17 Chapter 16: Waste Management summarises the assessment of waste impacts and effects from the Proposed Development.

19.6.18 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.

19.6.19 Construction waste is estimated to total up to 3,458m^3, equivalent to 5,099 tonnes. There may also be approximately 160,000 m^3 of surplus excavated material exported from Site. This is the worst case assumption as it may be possible to re-use some of the excavated material on or off Site.

19.6.20 Operational impacts include approximately 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 also be landfilled or could be recycled as a secondary aggregate (following treatment).

19.6.21 No significant effects with respect to waste management are anticipated.

GHG Emissions

19.6.22 In order to assess the magnitude of the impact of the Proposed Development on the climate, GHGs associated with construction and operation of the Proposed Development have been calculated. This assessment is detailed in Appendix 19A (ES Volume III, Document Ref. 6.4).

19.6.23 Due to the lower global warming potential of CO_2 (from waste incineration) as compared to methane (from decaying biomass materials in that waste if it were to go to landfill), energy recovery can lead to lower carbon equivalent emissions.

19.6.24 The total GHGs from constructing the Proposed Development are estimated to be 367,855 tCO_2e with the majority of emissions (92.8%) associated with the embodied carbon of materials used to construct the buildings and infrastructure. This is considerably less than 1% of the UK carbon budget for 2023-2027, so the effect is considered to be minor adverse.

19.6.25 The operation of the Proposed Development will generate GHGs (mainly from burning fuel (76.1% from refuse derived fuel usage)) but will also beneficially avoid GHGs from landfill and metals that can be recycled from bottom ash to displace the use of virgin metal sources. The net GHGs during operation are therefore predicted to be 45,297 tCO_2e per year, which equates to a carbon intensity of 72 tCO_2e per GWh (assuming that the gross electrical output from the Proposed Development is around 76 MW, rather than 95 MW). This is favourable compared to the current grid average carbon intensity (BEIS, 2019) of 173 tCO_2e per GWh. As the operational emissions (gross or net) are considerably less than 1% of the UK carbon budget for 2028-2032, the effect is considered to be minor adverse.

19.6.26 Decommissioning GHGs are expected to be lower than construction (mainly associated with waste transport and disposal) and are therefore not expected to be significant in terms of the UK meeting its carbon budgets.

Other Impacts of Climate Change on the Proposed Development

19.6.27 As shown in Tables 19.5 and 19.6, climate change is predicted to cause an increase in air temperatures, a decrease in summer rainfall and an increase in winter rainfall at the Site. Severe weather events are also likely to occur more frequently.

19.6.28 Construction of the Proposed Development is likely to commence in 2020, or at the latest in 2026, so the climatic conditions are expected to be the same as the current baseline. The Engineering Procurement and Construction (EPC) contractor will consider potential impacts on the construction programme and the health and safety of construction staff due to severe weather events such as

flooding, snow and ice, and storms, as a standard part of planning the construction phase.

19.6.29 As set out in Chapter 14: Water Resources, Flood Risk and Drainage, facilities will be provided during the construction phase to ensure controlled discharge of any surface water runoff that might occur and prevent pollution, and the contractor will prepare and implement a Flood Emergency Response Plan, using the Environment Agency Flood Warning Service.

19.6.30 As set out in the Flood Risk Assessment and Outline Drainage Strategy (Appendices 14A and 14B respectively, ES Volume III, Document Ref. 6.4), the surface water drainage system will be designed to include an allowance for climate change, so increased surface water runoff during winter will thereby be appropriately managed on Site during operation with no impact on flood risk.

19.6.31 Lower rainfall in summer and higher temperatures throughout the year due to climate change could lead to water stress and droughts during the operational phase. However as the Proposed Development will not have a high water demand (it will be air-cooled and process water will be recycled), and the design of buildings, structures and equipment will be capable of withstanding the predicted increased temperature, no significant effects are anticipated due to reduced summer rainfall and increased temperatures during operation.

19.6.32 During operation, the following other potential impacts have been identified as a result of the changing climate:

- health and safety risks to staff due to severe weather events;
- storm damage to buildings and structures;
- operational staffing issues due to severe weather events (flooding, snow and ice, and storms) preventing access to the Site.

19.6.33 As described in Chapter 14: Water Resources, Flood Risk and Drainage and the Flood Risk Assessment (Appendix 14A, ES Volume III, Document Ref. 6.4), the Proposed Development will be designed to be resilient and/ or resistant to flooding, including measures to ensure the safety of staff in the event of a flood and measures to reduce the Proposed Development's recovery time following a severe flood event.

19.6.34 Operational procedures will also be developed to minimise health and safety risks due to other severe weather events, and the Proposed Development will be designed to withstand reasonably anticipated weather conditions (snow, ice and storms).

Combined Impacts from Climate Change and the Proposed Development

19.6.35 The following potential combined impacts from climate change and the Proposed Development have been considered:

- increased flood risk for off Site receptors due to overtopping of the tidal flood defence (climate change impact) and increase surface water runoff from the Site (Proposed Development impact);

- increased risk of dust impacts on sensitive receptors during summer due to drier weather (climate change impact) and construction or demolition dust from the Site (Proposed Development impact);
- reduced risk of dust impacts on sensitive receptors during winter due to wetter weather (climate change impact) and construction or demolition dust from the Site (Proposed Development impact); and
- increased risk of noise impacts at sensitive residential receptors due to warmer weather encouraging residents to open windows more often (climate change impact) and noise from the Site (Proposed Development impact).

19.6.36 There will be no significant combined flood risk effect on off Site receptors because the Proposed Development design will include a surface water drainage system designed to allow for climate change and to discharge from the Site at greenfield runoff rate.

19.6.37 There will be no significant combined dust effects on sensitive receptors because Construction and Demolition Environmental Management Plans will be implemented to control dust at the Site.

19.6.38 There will be no significant combined noise effects on sensitive residential receptors due to the distance of the Site from the nearest residential property (approximately 1 km).

Comparison of Proposed Development and Consented Development

19.6.39 The assessments presented in Chapter 9: Traffic and Transport, Chapter 10: Ecology, Chapter 14: Water Resources, Flood Risk and Drainage, Chapter 15: Socio-Economics and Chapter 16: Waste Management conclude that the effects of the Proposed Development would be the same as the effects of the Consented Development.

19.6.40 In terms of GHGs, the Proposed Development would have the same construction, operational and decommissioning impacts as the Consented Development, but because the Proposed Development will be capable of generating more electricity than the Consented Development, the carbon intensity of the Proposed Development will be lower. The carbon intensity of the Proposed Development is assessed to be 72 tCO_2e per GWh, compared to the Consented Development's carbon intensity of 93 tCO_2e per GWh. Whilst both compare favourably to the current grid average carbon intensity of 173 tCO_2e per GWh, the Proposed Development is preferable to the Consented Development in terms of its carbon intensity as a result of the higher planned operational efficiency.

19.7 Mitigation and Enhancement Measures

19.7.1 Mitigation measures are set out in the relevant technical chapters of this ES.

19.7.2 The ecological assessment presented in Chapter 10: Ecology and the Biodiversity Strategy (Document Ref. 5.11) describe mitigation measures that will be implemented for ecological receptors. These include measures to mitigate piling noise effects on waterbirds during winter, protect water voles during installation of the new site access over a ditch, avoid impacts on breeding birds

and grass snake that may be present on Site, and proposals for habitat creation and enhancement within the Site.

19.7.3 The Flood Risk Assessment in Appendix 14A (ES Volume III, Document Ref. 6.4) describes flood resistance and resilience measures that will be incorporated into the design of the Proposed Development to avoid flood impacts. These include maintaining connectivity between the floodplain and the River Humber by not raising ground levels across the Site, using the Environment Agency Flood Warning Service, and raising critical equipment providing a safe refuge above the flood level.

19.7.4 The Outline Drainage Strategy in Appendix 14B (ES Volume III, Document Ref. 6.4) describes the principles of surface water drainage design that will be implemented to ensure the Proposed Development does not cause any increase in flood risk on or off Site, including an appropriate allowance for climate change.

19.7.5 The socio-economics assessment in Chapter 15: Socio-Economics describes the measures that will be used to promote employment opportunities to local residents and businesses.

19.7.6 No additional mitigation has been identified in this chapter.

19.8 Limitations or Difficulties

19.8.1 No significant limitations or difficulties have been encountered during the preparation of this assessment.

19.9 Residual Effects and Conclusions

19.9.1 The Proposed Development comprises a renewable energy development, providing low carbon electricity and diverting waste from landfill.

19.9.2 The Proposed Development has several characteristics incorporated into its design, construction and management which meet the key sustainability requirements as set out in national and local policy, as summarised below:

- although the Site is not rail-connected so road transport is most likely for fuel deliveries, opportunities to use nearby rail facilities will be considered during fuel contract negotiations;
- loss of habitat within the Main Development Area will be mitigated by the creation and enhancement of habitats elsewhere within the Site, and a financial contribution will be made to North East Lincolnshire Council for strategic mitigation habitat creation off Site;
- the Proposed Development will be designed to be resilient and resistant to increased tidal flood risk at the Site due to climate change;
- the Proposed Development will incorporate a surface water drainage system with a capacity allowance for climate change, discharging off Site at the greenfield runoff rate;
- the Proposed Development will generate employment, resulting in a significant beneficial employment effect during construction and operation;

- the Proposed Development will be CHP ready, reducing the need for grid electricity or gas and thereby providing opportunities for carbon savings;
- waste generated by the Proposed Development will be reduced where possible and managed in accordance with the waste hierarchy;
- GHG emissions from construction of the Proposed Development (mainly from embodied carbon in construction materials) are estimated to be minor adverse when compared to the UK carbon budget for the period;
- GHG emissions from operation of the Proposed Development will be partly offset by emissions savings achieved by diverting waste from landfill and recycling of metals in bottom ash, so the carbon intensity of the Proposed Development (72 tCO_2e per GWh) compares favourably to the current grid average carbon intensity (173 tCO_2e per GWh);
- the carbon intensity of the Proposed Development (72 tCO_2e per GWh) is lower than the carbon intensity of the Consented Development (93 tCO_2e per GWh) as a result of the higher planned operational efficiency of the Proposed Development; and
- no significant combined effects from climate change and the Proposed Development on sensitive receptors have been identified.

19.10 References

Committee on Climate Change (2019). *Reducing UK emissions: 2019 Progress Report to Parliament*

Department for Communities and Local Government (2014) *National Planning Policy for Waste*

Department for Energy and Climate Change (2011a). *Planning Our Electric Future: a White Paper for Secure, Affordable and Low Carbon Electricity*

Department for Energy and Climate Change (2011b). *Overarching National Policy Statement (NPS) for Energy: EN-1.* The Stationery Office, London.

Department for Energy and Climate Change (2011c). *National Policy Statement for Renewable Energy Infrastructure (EN-3).* The Stationery Office, London.

Department for Environment Food and Rural Affairs (2011). *The Government Review of Waste Policy in England 2011*.

Department for Environment Food and Rural Affairs (2018). *Our Waste, Our Resources: A Strategy for England*

North East Lincolnshire Council (2018) *Planning for Growth: Local Plan 2013 to 2032*.

Scott Wilson & Humber Estuary Coastal Authorities Group (SWHECA). (2010). *Humber Estuary Coastal Authorities Group Flamborough Head to Gibraltar Point Shoreline Management Plan: Non-Technical Summary*.

The Met Office (2019). UK Climate Projections User Interface. Available at: https://ukclimateprojections-ui.metoffice.gov.uk/

The Met Office (2020a). UK climate averages. Available at: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcxbxmgb8

The Met Office (2020b). UK and regional series. Available at: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-and-regional-series