Medworth Energy from Waste
Combined Heat and Power Facility

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Environmental Statement
Chapter 14: Climate

Regulation reference: The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 Regulation 5(2)(a)

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Contents

14. Climate

14.1 Introduction

14.1.1 This chapter presents the environmental assessment of the likely significant effects of the Proposed Development with respect to climate during the construction, operation and decommissioning phases of the Proposed Development. This assessment considers climate change in two ways:

- Greenhouse gas (GHG) emissions – the effects on the climate of GHG emissions arising from the construction, operation and decommissioning of the Proposed Development, including how the Proposed Development would affect the ability to achieve the UK carbon budgets and GHG emissions policy objectives at national, regional and local scales; and
- Vulnerability to climate change – the Climate Change Resilience (CCR) assessment demonstrates the effects of a changing climate on the Proposed Development, including how the design will mitigate the anticipated impacts of climate change.

14.1.2 The In-Combination Climate Change Impact (ICCI) assessment considers the extent to which climate change exacerbates effects on Receptors identified in the other topic chapters, including the efficacy of any mitigation. The ICCI is described in relevant topic environmental chapters of the Environmental Statement (ES).

14.1.3 This chapter should be read in conjunction with the description of the development provided in **Chapter 3: Description of the Proposed Development (Volume 6.2)**. The GHG assessment should be read in conjunction with relevant parts of: **Chapter 6: Traffic and Transport (Volume 6.2)**.

14.1.4 The CCR assessment should be read in conjunction with relevant parts of other environmental topic chapters where common Receptors have been considered and where there is an overlap or relationship between the assessment of effects. The relevant chapters are:

- **Chapter 9: Landscape and Visual (Volume 6.2);**
- **Chapter 11: Biodiversity (Volume 6.2);**
- **Chapter 12: Hydrology (Volume 6.2);**
- **Chapter 13: Geology, Hydrogeology and Contaminated Land (Volume 6.2); and**
- **Chapter 17: Major Accidents and Disasters (Volume 6.2).**

14.1.5 A list of terms and abbreviations can be found in **Chapter 1: Introduction, Appendix 1F (Volume 6.4)**.

14.2 Consultation and Stakeholder engagement

14.2.1 The assessment has been informed by consultation responses and ongoing Stakeholder engagement. An overview of the approach to consultation is provided in **Chapter 4: Approach to the EIA (Volume 6.2)**.

14.2.2 Details of the consultation responses and Stakeholder engagement undertaken in relation to the GHG emissions assessment are provided in **Appendix 14A Consultation and Stakeholder engagement (Volume 6.4)**.

14.2.3 Stakeholder engagement undertaken as part of **Chapter 12: Hydrology (Volume 6.2)** included issues raised around aspects of CCR. The issues and responses can be found in **Appendix 12B Stakeholder engagement (Volume 6.4)**. Resilience measures in response to the issues have been incorporated into this assessment.

14.3 Relevant legislation, planning policy, technical guidance

Legislative context

14.3.1 Legislation relevant to the assessment of the effects on climate change is provided in **Table 14.1 Legislative context for climate.**

Table 14.1 Legislative context for climate

Legislation	Implications
Climate Change Act 2008[1] (including The Climate Change Act 2008 (2050 Target Amendment) Order 2019[2])	This Act, as amended in 2019, commits the UK to reduce its net GHG emissions by at least 100% below 1990 levels by 2050 (the 'UK carbon target', often referred to as 'net zero') and requires the Government to establish five-year carbon budgets. The Act also established an independent expert body, the Climate Change Committee, to advise the Government on the level of those emissions targets and report on progress made to reduce emissions. The Act sets out reporting requirements in the form of the UK Climate Change Risk Assessment (CCRA) every five years, a mechanism for gathering and presenting evidence to help understand climate change risks to the UK. The Third CCRA was published by the UK Government in January 2022[3] and draws from the latest evidence prepared by the Adaptation Committee presented in the Independent Assessment of UK Climate Risk 2021[4].
The Carbon Budgets Order 2009[5]	This legislation implements the carbon budgets set out in the Climate Change Act 2008[1]. The budgets require the UK to continually reduce emissions in line with the carbon reduction commitments established under that Act. The carbon budgets are: • First carbon budget, 2009 to 2012, 3,018 mega tonnes carbon dioxide equivalent ($MtCO_2e$) representing 25% reduction below 1990 levels;

[1] *Climate Change Act 2008*.
[2] *The Climate Change Act 2008 (2050 Target Amendment) Order 2019*.
[3] UK Government. UK Climate Change Risk Assessment 2022.
[4] Betts, R.A. and Brown, K, (2021). Introduction. In: *The Third UK Climate Change Risk Assessment Technical Report* [Betts, R.A.,Haward, A.B. and Pearson, K.V.(eds.)]. Prepared for the Climate Change Committee, London.
[5] *The Carbon Budgets Order 2009*.

Legislation	Implications
	• Second carbon budget, 2013 to 2017, 2,782 $MtCO_2e$ representing 31% reduction below 1990 levels; • Third carbon budget, 2018 to 2022, 2,544 $MtCO_2e$ representing 37% reduction below 1990 levels by 2020; • Fourth carbon budget, 2023 to 2027, 1,950 $MtCO_2e$ representing 51% reduction below 1990 levels by 2025[6]; • Fifth carbon budget, 2028 to 2032, 1,725 $MtCO_2e$ representing 57% reduction below 1990 levels by 2030;[7] and • Sixth carbon budget, 2033 to 2037, 965 $MtCO_2e$ representing 78% reduction below 1990 levels by 2035.[8]
Energy Act 2016[9]	The Energy Act 2016 is a UK Act of Parliament relating to UK enterprise law and energy in the UK. It covers three main areas, establishes the Oil and Gas Authority (OGA), sets out the formal powers of the OGA and sets out the closure of the Renewables Obligation for onshore wind in England, Wales and Scotland.
The Environmental Permitting (England and Wales) Regulations 2016 (SI 2016/1154)[10]	The Environment Agency acts as the Competent Authority and regulates relevant activities under the Environmental Permitting (England and Wales) Regulations 2016 (SI 2016/1154. Under this permitting regime waste installations are required to undertake CCRAs.
Environment Act 2021[11]	An Act to make provision about targets, plans and policies for improving the natural environment, including waste management and resource efficiency (Part 3). The Act aims to help the Government achieve the net zero carbon emissions target. It establishes a new public body, the Office for Environmental Protection which will act as an independent, domestic watchdog. All climate change legislation (including carbon budgets) is within the enforcement remit of the body, ensuring that there is no governance gap in relation to climate change legislation.

Planning policy context

14.3.2 There are a number of policies at the national and local level that are relevant to the Proposed Development. The National Policy Statements (NPS), which provide the primary policy basis for the consideration of Nationally Significant Infrastructure Projects (NSIPs), are provided in **Table 14.2 Planning policy context for GHG assessment: Adopted National Policy Statements** for GHG assessment and **Table 14.4 Planning policy context for CCR assessment: National Policy Statements for CCR assessment.** This section should be read in conjunction with **Chapter 5: Legislation and Policy (Volume 6.2)**.

14.3.3 In September 2021, the Department of Business, Energy and Industrial Strategy (BEIS) consulted upon a review of the energy NPS with consultation closing on 29 November 2021. The energy NPS were reviewed to reflect the policies and broader strategic approach set out in the white paper and ensure a planning framework was

[6] The Carbon Budget Order 2011.
[7] The Carbon Budget Order 2016.
[8] The Carbon Budget Order 2021.
[9] Energy Act 2016.
[10] The Environmental Permitting (England and Wales) Regulations 2016.
[11] Environment Act 2021.

in place to support the infrastructure requirement for the transition to net zero. Those Draft NPS considered relevant to the Proposed Development are considered in **Table 14.3 Planning policy context for GHG assessment: Draft National Policy Statements for GHG assessment** and **Table 14.5 Planning policy context for CCR assessment: Draft National Policy Statements** for CCR assessment.

Table 14.2 Planning policy context for GHG assessment: Adopted National Policy Statements

Policy reference	Implications	Section addressed
Overarching National Policy Statement for Energy (EN-1)[12]	EN-1 sets out general assessment principles for applications relating to energy infrastructure. The Energy NPS aims to "*speed up the transition to a low carbon economy and thus help to realise the UK climate change commitments sooner than continuation under current planning system*" [1.7.2]. Note the "*current planning system*" as described in the Energy NPS has since been updated with more ambitious carbon reduction targets. EN-1 notes that the ES should consider the impacts of climate change when planning the location, design, build and operation of new energy infrastructure.	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050, to which EN-1 is aligned. The assessment also considers the offset of GHG emissions from the generation of electricity by the EfW CHP Facility, relative to the production of electricity from the UK grid mix.
National Policy Statement for Renewable Energy Infrastructure (EN-3)[13]	EN-3 provides additional technology-specific guidance to complement EN-1[12]. It states that through supporting the transition to a low carbon economy, EN-3 is considered likely to have positive effects on the climate change objective in the medium and long term [1.7.2].	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050, to which EN-3 is aligned. The assessment also considers the offset of GHG emissions from the generation of electricity by the EfW CHP Facility, relative to the production of electricity from the UK grid mix.
National Policy Statement for Electricity Networks Infrastructure (EN-5)[14]	EN-5 is relevant to the consideration of the Grid Connection associated with the Proposed Development (see **Chapter**	The assessment described in **Section 14.9** is based on assessing whether the Proposed

[12] Department for Business, Energy and Industrial Strategy (2011). Overarching National Policy Statement for Energy (EN-1).
[13] Department for Business, Energy and Industrial Strategy (2011). National Policy Statement for Renewable Energy Infrastructure (EN-3).
[14] Department for Business, Energy and Industrial Strategy (2011). National Policy Statement for Electricity Networks Infrastructure (EN-5).

Policy reference	Implications	Section addressed
	5: Legislation and Policy (Volume 6.2)).	Development would impede the UK in being carbon net zero by 2050, to which EN-5 is aligned.

Table 14.3 Planning policy context for GHG assessment: Draft National Policy Statements

Policy reference	Implications	Section addressed
Draft Overarching National Policy Statement for Energy (Draft EN-1)[15]	The 2021 Draft EN-1 includes the same principles relating to the GHG assessment as EN-1, accounting for updates to carbon reduction targets. Draft EN-1 acknowledges that to achieve net zero by 2050 "*We will need to dramatically increase the volume of energy supplied from low carbon sources and reduce the amount provided by fossil fuels*." [2.3.4] and that "*Energy recovery from residual waste has a lower GHG impact than landfill*" [3.3.33]. Draft EN-1 also notes that the ES should include a whole life carbon assessment [5.3.4].	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050, to which EN-1 is aligned. The GHG assessment considers the net change between two scenarios: the 'with Proposed Development' case in which the EfW CHP Facility is constructed and operated, and the 'without Proposed Development' case in which the residual waste is disposed of at landfill. The assessment also considers the offset of GHG emissions from the generation of electricity by the EfW CHP Facility, relative to the production of electricity from the UK grid mix. **Table 14.17** details the life cycle stages considered in the assessment.
Draft National Policy Statement for Renewable Energy Infrastructure (Draft EN-3)[16]	The 2021 Draft EN-3 includes the same principles relating to the GHG assessment as EN-3. Section 2.13 sets out specific GHG considerations that apply to EfW facilities, including: assessment methodology and mitigation.	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050. The assessment also considers the offset of GHG emissions from the generation of electricity by the EfW CHP Facility, relative to the production of electricity from the UK grid mix. **Sections 14.7** and **14.9** detail the mitigation measures for reducing GHG emissions.

[15] Department for Business, Energy and Industrial Strategy (2021). Draft Overarching National Policy Statement for Energy (EN-1).
[16] Department for Business, Energy and Industrial Strategy (2021). Draft National Policy Statement for Renewable Energy Infrastructure (EN-3).

Policy reference	Implications	Section addressed
Draft National Policy Statement for Electricity Networks Infrastructure (Draft EN-5)[17]	The 2021 Draft EN-5 includes the same principles relating to the GHG assessment as EN-5. It acknowledges the need for new energy networks in the transition to net zero.	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050, to which EN-5 is aligned.

Table 14.4 Planning policy context for CCR assessment: National Policy Statements

Policy reference	Implications	Section addressed
Overarching National Policy Statement (NPS) for Energy (EN-1)[12]	**Section 4.8** of EN-1 includes general considerations to ensure electricity networks infrastructure is resilient to climate change. It notes that applicants should take the effects of climate change into account when developing infrastructure. New energy infrastructure should be designed to be sufficiently resilient to potential climate change impacts so as to satisfy the requirements of the NPS. The resilience of a project to climate change should be assessed within the ES accompanying an application.	The CCR assessment described in **Section 14.9** identifies the future baseline in terms of climatic conditions and the risks these represent during construction, operation and decommissioning. **Section 14.7** and **14.9** detail the mitigation measures for improving CCR.
National Policy Statement for Renewable Energy Infrastructure (EN-3)[13]	EN-3 includes considerations for renewable energy infrastructure such that it is resilient to climate change. At paragraph 2.3.3, it states that EfW generating stations may require significant water resources and that "*applicants should consider, in particular, how plant will be resilient to:* • *increased risk of flooding; and* • *increased risk of drought affecting river flows*."	The CCR assessment described in **Section 14.9** identifies the future baseline in terms of climatic conditions and the risks these represent during construction, operation and decommissioning.
National Policy Statement for Electricity Networks Infrastructure (EN-5)[14]	EN-5 is relevant to the consideration of the grid connection associated with the Proposed Development. Section 2.4 considers climate change adaptation and states that the applicant should in particular set out the "*extent the proposed development is expected to be vulnerable, and, as appropriate, how it would be resilient to:*	The CCR assessment described in **Section 14.9** identifies the future baseline in terms of climatic conditions and the risks these represent during construction, operation, and decommissioning.

[17] Department for Business, Energy and Industrial Strategy (2021). Draft National Policy Statement for Electricity Networks Infrastructure (EN-5).

Policy reference	Implications	Section addressed
	• *flooding, particularly for substations that are vital for the electricity transmission and distribution network;* • *effects of wind and storms on overhead lines;* • *higher average temperatures leading to increased transmission losses; and* • *earth movement or subsidence caused by flooding or drought (for underground cables).”*	

Table 14.5 Planning policy context for CCR assessment: Draft National Policy Statements

Policy reference	Implications	Section addressed
Draft overarching National Policy Statement for energy (Draft EN-1)[15]	The 2021 Draft EN-1 includes the same principles relating to the CCR assessment as EN-1. It also goes further, seeking nature-based solutions, refers to the EA’s Climate Change Allowances in Flood Risk Assessments and highlights the need to demonstrate climate resilience which is built-in to projects from conception.	The CCR assessment described in **Section 14.9** identifies the future baseline in terms of climatic conditions and the risks these represent during construction, operation and decommissioning. **Section 14.7** and **14.9** detail the mitigation measures for reducing GHG emissions.
Draft National Policy Statement for Renewable Energy Infrastructure (Draft EN-3)[16]	The 2021 Draft EN-3 includes the same principles relating to the CCR assessment as EN-3.	The CCR assessment described in **Section 14.9** identifies the future baseline in terms of climatic conditions and the risks these represent during construction, operation and decommissioning.
Draft National Policy Statement for Electricity Networks Infrastructure (Draft EN-5)[17]	The 2021 Draft EN-5 includes the same principles relating to the CCR assessment as EN-5.	The CCR assessment described in **Section 14.9** identifies the future baseline in terms of climatic conditions and the risks these represent during construction, operation, and decommissioning.

14.3.4 Other national and local policies which provide additional guidance that may be considered material to the consideration of a NSIP are detailed in **Table 14.6 Other policy context for GHG emissions assessment for GHG assessment** and **Table 14.7 Other policy context for CCR assessment** for CCR assessment.

Table 14.6 Other policy context for GHG emissions assessment

Policy reference	Implications	Section addressed
International policy		
The United Nations Framework Convention on Climate Change (UNFCCC) Paris Agreement[18]	The UNFCCC is one of the major international bodies responsible for managing climate change and carbon emissions. In 2015, it adopted the Paris Agreement, the aims of which are stated as: "*This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by: (a) Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change*". The agreement sets targets for countries' GHG emissions, but these are not legally binding or enforceable.	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050, this being the UK position in terms of meeting international obligations to reduce carbon emissions.
UNFCCC Kyoto Protocol[19]	The Kyoto Protocol was adopted in December 1997. It commits industrialised countries and economies to transition to limit and reduce GHG emissions in accordance with agreed individual targets. These have been strengthened in more recent international agreements culminating in the Paris Agreement, as described above. The Kyoto Protocol contains a list of six GHGs to be reported, which remains relevant in the Paris Agreement, namely: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), F-gases (comprised of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs)), sulphur hexafluoride (SF_6), and nitrogen trifluoride (NF_3). In this GHG assessment, these six GHG are collective considered "GHG emissions" and reported as carbon dioxide equivalent (CO_2e) GHG emissions.	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would have a likely significant effect on the ability of the UK to achieve its statutory carbon net zero target by 2050.
UNFCCC Glasgow Climate Pact[20]	The recent Conference of the Parties (COP 26) held in Glasgow in November 2021, resulted in almost 200 countries agreeing on: the acceleration of action on climate change this decade to reduce emissions (mitigation); helping those already impacted by climate change (adaption); enabling countries to deliver on their climate goals (finance); and working together to deliver even greater action (collaboration). This agreement is in the form of the Glasgow Climate Pact which reaffirms the long-term goal to limit global warming to 1.5°C above pre-industrial levels and resolves to pursue efforts to	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050, this being the UK position in terms of meeting international obligations to reduce carbon emissions.

[18] UNFCCC (2015). Paris Agreement.
[19] UNFCCC (1998). *Kyoto Protocol*.
[20] UNFCCC (2021). *Glasgow Climate Pact*.

Policy reference	Implications	Section addressed
	achieve this, recognising that limiting global warming to 1.5°C "*requires rapid, deep and sustained reductions in global greenhouse gas emissions, including reducing global CO_2 emissions by 45% by 2030 relative to the 2010 level and to net zero around mid-century, as well as deep reductions in other greenhouse gases*".	
National		
National Planning Policy Framework (NPPF)[21]	The NPPF, paragraph 152 states: "*The planning system should support the transition to a low carbon future in a changing climate…it should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions… and support renewable and low carbon energy and associated infrastructure*". It also requires in paragraph 154 (b) that new development should be planned for in ways that "*can help to reduce greenhouse gas emissions, such as through its location, orientation and design.*". Furthermore, it is stated in paragraph 157, that local planning authorities should expect new development to: "*comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and* *take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.*"	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050, to which the NPPF is aligned.
National Planning Policy for Waste (NPPW)[22]	The NPPW sets out the Government's ambition to work towards a more sustainable and efficient approach to resource use and management. It states that "*positive planning plays a pivotal role in delivering this country's waste ambitions through … wider climate change benefits, by driving waste management up the waste hierarchy*" [paragraph 1]. It also states that waste planning authorities should: "plan for the disposal of waste and the recovery of mixed municipal waste in line with the proximity principle, recognising that new facilities will need to serve catchment areas large enough to secure the economic viability of the plant" [paragraph 4].	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050, to which the NPPW is aligned.

[21] Ministry of Housing, Communities and Local Government (2021). National Planning Policy Framework.
[22] Ministry of Housing, Communities and Local Government (2014). National Planning Policy for Waste.

Policy reference	Implications	Section addressed
Clean Growth Strategy[23]	This report, prepared by BEIS, provides the strategy for the UK's future clean growth to allow carbon budgets to be met and support economic growth. It sets out policies and targets out to 2050 for reducing GHG emissions across a number of sectors. Whilst not in itself planning policy it is a material consideration.	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050.
The Ten Point Plan for a Green Industrial Revolution[24]	This plan sets out the UK Government's approach to "build back better" following the impacts of the COVID-19 pandemic. It includes details of how the Government intend to accelerate the path to net zero.	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050.
Net Zero Strategy: Build Back Greener[25]	This strategy sets out sectoral policies and proposals for decarbonising all sectors of the UK economy to meet the coming carbon budgets, the NDC and the net zero target by 2050. It aims to enable the delivery of the objectives set out in the Ten Point Plan.	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050.
The UK's Nationally Determined Contribution (NDC) under the Paris Agreement[26]	In December 2020, the UK submitted its first NDC under the Paris Agreement to the UNFCCC, committing to "*reduce economy-wide greenhouse gas emissions by at least 68% by 2030, compared to 1990 levels*".	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050.
Local Policy		
Cambridgeshire County Council (CCC) and Peterborough City Council Minerals and Waste Local Plan 2036 (2021)[27]	As described in Chapter 5 Legislation and Policy (Volume 6.2), CCC and Peterborough City Council Minerals and Waste Local Plan was adopted on 28 July 2021. Policy 1 Sustainable Development and Climate Change states that development proposals will be assessed as to whether they move toward sustainable solutions; that they should take a proactive approach to mitigating climate change and sets out criteria against how this could be achieved.	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050 and makes reference to local policies to minimise GHG emissions. The GHG assessment considers the net change between two scenarios: the more sustainable 'with Proposed Development' case in which the EfW CHP Facility is constructed and

[23] Department for Business, Energy and Industrial Strategy (2017) Clean Growth Strategy.
[24] HM Government (2020). The Ten Point Plan for a Green Industrial Revolution.
[25] Department for Business, Energy & Industrial Strategy (2021). Net Zero Strategy: Build Back Greener.
[26] Department for Business, Energy & Industrial Strategy (2020). The UK's Nationally Determined Contribution under the Paris Agreement.
[27] Cambridgeshire County Council and Peterborough City Council (2021). Minerals and Waste Local Plan 2036.

Policy reference	Implications	Section addressed
		operated, and the 'without Proposed Development' case in which the residual waste is disposed of at landfill. **Section 14.7 and 14.9** detail the mitigation measures for reducing GHG emissions.
Cambridgeshire County Council Climate Change and Environment Strategy 2020 - 2025 (2022)[28]	CCC's Climate Change and Environment Strategy and Action Plan sets a vision for Cambridgeshire to *"deliver net-zero carbon emissions by 2050 in partnership with all stakeholders*". Three key themes are identified in terms of mitigation, adaptation and natural capital. The Strategy clearly states that it is for "*Cambridgeshire County Council*" but also identifies that public and private sector organisations will need to support in order to achieve the vision. Seven targets are identified within the Strategy and two of these will be delivered in collaboration with partners and communities. In particular these are: "*By 2023, sign up to a shared target with partners and the community to deliver 50.4% greenhouse gas emissions reductions by 2030 in tonnes/CO_2 per annum for Cambridgeshire based on the 2018 baseline; and* *Deliver Government's net zero-carbon target for Cambridgeshire by 2050*."	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050. This is complemented by a qualitative assessment against regional and local GHG emissions policy, including CCC's decarbonisation targets.
Fenland Local Plan (Adopted) (2014)[29]	The Local Plan sets out the key objectives including "*increased use of renewable energy sources whilst minimising waste and the use of other energy sources*". Policy LP14 states that *"All developments (dwellings and non-dwellings) are encouraged to incorporate on site renewable and/or decentralised renewable or low carbon energy sources, water saving measures and measures to help the development withstand the longer-term impacts of climate change."*	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050 and makes reference to local policies to minimise GHG emissions. The assessment also considers the offset of GHG emissions from the generation of electricity by the EfW CHP Facility, relative to the production of electricity from the UK grid mix. **Section 14.7 and 14.9** detail the mitigation measures for reducing GHG emissions, including

[28] Cambridgeshire County Council (2022). Climate Change and Environment Strategy.
[29] Fenland District Council (2014). Fenland Local Plan (Adopted).

Policy reference	Implications	Section addressed
		CHP capabilities. **Chapter 3: Description of the Proposed Development (Volume 6.2)** references the use of grey water recycling, solar panels and BREEAM 'Excellent' certification for the administration building with the rest of the EfW CHP Facility 'Good'.
Norfolk Core Strategy and Minerals and Waste DMP Development Plan Document 2010-2026[30]	The policy encourages waste and minerals site to generate a minimum of 10% renewable energy on site. All new residual waste treatment plants to generate electricity and/or capture heat and policy encouragement to co-locate large waste plants generating heat and/or electricity with other nearby industrial and/or residential users of heat and/or energy. Requirement to demonstrate sites can be developed without unacceptable flood risk.	The Proposed Development is located adjacent to industrial users of heat and energy and includes for a CHP Connection to provide them with the opportunity to take the heat and electricity generated. The Proposed development is classified as a renewable energy project and in addition to the generation of electricity and head within the EfW CHP Facility it includes for the provision of solar panels to the administration building.
Norfolk County Council's Environmental Policy (2019)	Norfolk County Council's Environmental Policy was published in November 2019. It states that Norfolk County Council will "work with our neighbours within the region ... to collectively achieve 'net zero' carbon emissions on our estates by 2030, but within our wider area, work towards 'carbon neutrality' also by 2030".	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050. This is complemented by a qualitative assessment against regional and local policy, including Norfolk County Council's decarbonisation targets.
King's Lynn and West Norfolk Local Development Framework Core Strategy (2011)[31]	The document identifies climate change as a key sustainability issue and that GHG emissions from the Borough are higher than the national average.	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050 and makes reference to local policies to minimise

[30] Norfolk County Council (2011) Norfolk Minerals and Waste LDF. Core Strategy and Minerals and Waste DMP Development Plan Document 2010-2026.
[31] King's Lynn and West Norfolk Borough Council (2011). Local Development Framework Core Strategy.

Policy reference	Implications	Section addressed
		GHG emissions. The GHG assessment considers the net change between two scenarios: the more sustainable 'with Proposed Development' case in which the EfW CHP Facility is constructed and operated, and the 'without Proposed Development' case in which the residual waste is disposed of at landfill. **Section 14.7 and 14.9** detail the mitigation measures for reducing GHG emissions.
Borough Council of King's Lynn and West Norfolk Climate Change Strategy and Action Plan 2021 – 2024 [32]	The King's Lynn and West Norfolk (KLWN) Climate Change Strategy and Action Plan sets out how the Council will address their own carbon footprint and act as a community leader to encourage others to tackle climate change. The Policy aims to ensure the council plays its part in contributing to achieving the Climate Change Act 2008 and the Paris Climate Agreement.	The assessment described in **Section 14.9** is based on assessing whether the Proposed Development would impede the UK in being carbon net zero by 2050, this being the UK position in terms of meeting international obligations to reduce carbon emissions. This is complemented by a qualitative assessment against regional and local GHG emissions policy

Table 14.7 Other policy context for CCR assessment

Policy reference	Implications	Section addressed
International Policy		
UNFCCC Paris Agreement[18]	The UNFCCC is one of the major international bodies responsible for managing climate change and carbon emissions. In 2015, it adopted the Paris Agreement, the aims of which are stated as: *"(b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production*" (Article 2, (1)).	The CCR assessment described in **Section 14.9** identifies the future baseline in terms of climatic conditions and the risks these represent during construction, operation and decommissioning.

[32] Borough Council of King's Lynn and West Norfolk (2021). Climate Change Policy.

Policy reference	Implications	Section addressed
UNFCCC Glasgow Climate Pact[20]	The Glasgow Pact emphasised the urgency of the scaling up of action and support to *"enhance adaptive capacity, strengthen resilience and reduce the vulnerability to climate change*".	The CCR assessment described in **Section 14.9** identifies the future baseline in terms of climatic conditions and the risks these represent during construction, operation and decommissioning.
National Policy		
National Planning Policy Framework (NPPF)[21]	The NPPF sets out in paragraph 153 that Local Plans: "*should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply and changes to biodiversity and landscape, and the risk of overheating from rising temperatures*". Paragraph 154 states that: "*New developments should be planned for in ways that:* *a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure"*. Paragraph 157 also states that: *"in determining planning applications, local planning authorities should expect new development to:* *a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable"*. The supporting Environment Agency planning practice guidance, flood risk assessments: climate change allowances[33], contains the percentage uplifts for climate change to be added to assessments.	The CCR assessment described in **Section 14.9** identifies the future baseline in terms of climatic conditions and the risks these represent during construction, operation and decommissioning.
25 Year Environment Plan[34]	This plan sets out how government action will help the natural world and how the UK Government will tackle the effects of climate	**Section 14.5** has considered the future baseline for the possible extent of climate change.

[33] Environment Agency (2021). Flood risk assessments: climate change allowances.
[34] UK Government (2021). A Green Future: Our 25 Year Plan to Improve the Environment

Policy reference	Implications	Section addressed
	change, by ensuring all policies, programmes and investment decisions take into account the possible extent of climate change this century.	
Local Policy		
Cambridgeshire County Council and Peterborough City Council Minerals and Waste Local Plan 2036 (2021)[27]	Policy 1 Sustainable Development and Climate Change states that development proposals will be assessed as to whether they move toward sustainable solutions; that they should take a proactive approach to adapting to climate change and sets out criteria against how this could be achieved.	The CCR assessment described in **Section 14.9** identifies the future baseline in terms of climatic conditions and the risks these represent during construction, operation and decommissioning. The CCR assessment includes the embedded mitigation measures which indicate that sustainable solutions have been integrated into the design in a proactive approach, as demonstrated in **Table 14.15**, **Table 14.33**, **Table 14.34** and **Table 14.35**.
Fenland Local Plan (Adopted) (2014)[29]	Policy LP14 states that "*All developments (dwellings and non-dwellings) are encouraged to incorporate on site renewable and/or decentralised renewable or low carbon energy sources, water saving measures and measures to help the development withstand the longer-term impacts of climate change*."	The CCR assessment described in **Section 14.9** identifies the future baseline in terms of climatic conditions and the risks these represent during construction, operation and decommissioning. **Table 14.15, Table 14.33**, **Table 14.34** and **Table 14.35** contain the mitigation such as water saving and CCR measures.
King's Lynn and West Norfolk Local Development Framework Core Strategy (2011)[31]	CS08 Sustainable development considers climate change in the context of flood risk.	The CCR assessment described in **Section 14.9** identifies the future baseline in terms of climatic conditions and the risks these represent during construction, operation and decommissioning. **Table 14.15, Table 14.33, Table 14.34** and **Table 14.35** contain the mitigation measures related to flood risk. Additionally, climate change in relation to flood risk is addressed in **Chapter 12: Hydrology (Volume 6.2**).
King's Lynn and West Norfolk Local Development Framework Site Allocations and	Policy DM 21 states that applications for development in zones 2 and 3 will need to be accompanied by a flood risk assessment	**Chapter 12: Hydrology (Volume 6.2)** considers climate change within design and is accompanied by a **Flood Risk**

Policy reference	Implications	Section addressed
development Management Policies (2016)[35]	which includes for climate change allowance.	**Assessment (FRA) (Volume 6.4)**.
Cambridgeshire County Council Climate Change and Environment Strategy 2020 - 2025 (2022)[28]	CCC's Climate Change and Environmental Strategy notes five priority areas regarding climate change adaptation to cope with the future impacts of climate change: "*Resilience of our services, infrastructure and supporting vulnerable people;* *Resilient infrastructure and highways – using innovations to improve resilience of our highways;* *Flood risk – innovation to enable us to better cope with unpredictable extreme weather events;* *Water availability – working with partners to improve the County's water security; and* *Green and Blue Infrastructure – work with partners to develop a network of green space and water assets which can deliver quality of life and environmental benefits*."	The CCR assessment described in **Section 14.9** identifies the future baseline in terms of climatic conditions and the risks these represent during construction, operation and decommissioning.
Norfolk Core Strategy and Minerals and Waste DMP Development Plan Document 2010-2026	The policy includes a requirement to demonstrate that sites can be developed without unacceptable flood risk.	An **FRA** has been undertaken and is reported in **Appendix 8A (Volume 6.4).**
Norfolk County Council's Environmental Policy (2019)	The Council notes that its Environmental Policy reflects the increasing importance of adapting to climate change.	The CCR assessment described in **Section 14.9** identifies the future baseline in terms of climatic conditions and the risks these represent during construction, operation and decommissioning.
Borough Council of King's Lynn and West Norfolk Climate Change Strategy and Action Plan 2021 - 2024 [32]	The KLWN Climate Change Policy sets out how the Council will improve resilience to future climate predictions. All sectors in the district are encouraged to adapt to the likely impacts of climate change.	The CCR assessment described in **Section 14.9** identifies the future baseline in terms of climatic conditions and the risks these represent during construction, operation and decommissioning.

Technical guidance

14.3.5 Technical guidance used to inform the assessment is listed in **Table 14.8 Technical guidance for GHG emissions** assessment for GHG emissions assessment and **Table 14.9 Technical guidance for CCR assessment or CCR assessment.**

[35] King's Lynn and West Norfolk Borough Council (2016). Development Framework Site Allocations and Development Management Policies.

Table 14.8 Technical guidance for GHG emissions assessment

Technical guidance	Implications
Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance – 2nd Edition[36]	The Institute of Environmental Management and Assessment (IEMA) provides guidance on GHG emissions assessment, mitigation and reporting within an Environmental Impact Assessment (EIA) context and this is the primary source of guidance for assessing GHG emissions. The 2022 guidance builds upon the 2017 guidance, with key changes including an emphasis on mitigation at the project outset and throughout its lifetime, and more nuanced levels of GHG emissions significance. It provides detail on the application of the five IEMA Principles on Climate Change Mitigation and EIA: 1. The GHG emissions from all projects will contribute to climate change, the largest inter-related cumulative environmental effect. 2. The consequences of a changing climate have the potential to lead to significant environmental effects on all topics in the EIA Directive (e.g., human health, biodiversity, water, land use, air quality). 3. The UK has legally binding GHG reduction targets – EIA must therefore give due consideration to how a project will contribute to the achievement of these targets. 4. GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reductions from a project might be considered to be significant. 5. The EIA process should, at an early stage, influence the location and design of projects to optimise GHG performance and limit likely contribution to GHG emissions.
Publicly Available Standard (PAS) 2080: 2016 – Carbon management in infrastructure[37]	PAS 2080:2016 provides an approach to reducing GHG emissions from infrastructure projects including working with stakeholders throughout the project lifecycle. Formal Stakeholder engagement has been undertaken, and further discussions have been undertaken regarding the assessment methodology whereby a technical note was submitted to Stakeholders. The responses to this technical note are reported in **Appendix 14A Consultation and Stakeholder engagement (Volume 6.4).**
The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (GHG Protocol)[38]	GHG Protocol provides standards and guidance for preparing a GHG emissions inventory. The GHG assessment has taken full account of this protocol when deciding upon the assignment of emission sources to then allow for the calculation of associated emissions.
Methodology to calculate embodied carbon 1st edition[39]	The Royal Institution of Chartered Surveyors (RICS) guidance note represents best practice on how to estimate carbon emissions associated with product and construction process stages. The aim of the guidance is to provide a framework of practical guidance on how to calculate embodied carbon emissions associated with projects.

[36] IEMA (2022). Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance – 2nd Edition.
[37] The Green Construction Board, Construction Leadership Council (2016). PAS 2080:2016 Carbon Management in Infrastructure.
[38] World Resources Institute and World Business Council for Sustainable Development (2015). The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition).
[39] RICS. (2012). Methodology to calculate embodied carbon 1st edition.

Technical guidance	Implications
Guidance from government statutory bodies	
Net Zero – The UK's contribution to stopping global warming[40]	This report prepared by the Climate Change Committee to the UK Government responds to a request from the UK governments to provide updated advice on the UK's long-term GHG emission target, including the possibility of setting a "net zero" target, following recent Intergovernmental Panel on Climate Change (IPCC) special report on 1.5°C[41]. The report suggests that the UK "*should set and vigorously pursue an ambitious target to reduce greenhouse gas emissions (GHGs) to 'net zero' by 2050*". The report recommends a net zero date of 2050 could be achieved through known technologies, improvements in people's lives and policy updates.
The Government Response to the Climate Change Committee's 2021 Progress Report to Parliament[42]	This white paper is the UK Government's response to the Climate Change Committee's 2021 progress report and sets out policy recommendations for Government departments. It is stated that "*Our view is that energy from waste should not compete with greater waste prevention, re-use or recycling, however, it does play an important role in diverting waste from landfill and is generally the best management option for most residual waste*."
The Climate Change Committee Sixth Carbon Budget Report[43]	This report sets out statutory advice to the UK Government from the Climate Change Committee on recommendations for a Sixth Carbon Budget.
The Sixth Carbon Budget – Waste[44]	This document contains a summary of content for the waste sector from the Sixth Carbon Budget Advice. Waste sector emissions, including EfW plants, accounted for 6% of UK GHG emissions in 2018 and were 63% below 1990 levels. The Climate Change Committee states that sector emissions from waste can be reduced from today's levels by 75% by 2050. A recommendation for reducing GHG emissions in the waste sector is through the installation of carbon, capture and storage (CCS) on all EfW plants. The Proposed Development will be CCS. retrofit ready with land set aside for a CCS facility. However, the Application does not include the construction and operation of the carbon capture technology within the Proposed Development.
Transport Decarbonisation Plan[45]	This plan sets out the UK Government's commitments and the actions needed to decarbonise the entire transport system in the UK. Government emissions factors from the Emissions Factors Toolkit are used in this assessment to account for reducing emissions in the future.

[40] CCC (2019). Net Zero – The UK's contribution to stopping global warming.
[41] IPCC (2018). Special Report on Global Warming of 1.5ºC,
[42] HM Government (2021). The Government Response to the Committee on Climate Change's 2021 Progress Report to Parliament.
[43] CCC (2020). Sixth Carbon Budget.
[44] CCC (2020). The Sixth Carbon Budget – Waste.
[45] DfT (2021). Decarbonising transport: a better, greener Britain.

Table 14.9 Technical guidance for CCR assessment

Technical guidance	Implications
UKCP18 projections[46]	UK Climate Projections 2018 (UKCP18) has been produced by the Met Office and provides the latest set of climate change projections for the UK. It includes projections of how climate variables could change in the coming decades, as well as forecasts for sea level rise. UKCP18 projections are used in the CCR assessment (**Section 14.9**). Where UKCP18 projection data is not available for certain parameters, available qualitative literature has been used.
UKCP18 technical notes including: **1. Science Overview Report**[47] **2. UKCP18 Land projections: Science Report**[48] **3. UKCP18 Factsheets**[49]	The UKCP18 technical notes provide information on both projections for future time periods. The technical notes were used to inform the development of the future baseline in **Section 14.5**. These fact sheets would be used in the resilience assessment when relevant projections are not available, for example snow and wind parameters.
ISO14091 Adaptation to climate change – Guidelines on vulnerability, impacts and risk assessment[50]	This international standard provides guidelines on approaches to assessing climate change-related risks. It states that "*risk assessments improve planning of adaptation to climate change and inform the implementation and monitoring of climate change adaptation activities*".
Commission Notice – Technical guidance on the climate proofing of infrastructure in the period 2021 - 2027[51]	This note gives technical guidance on the climate proofing of infrastructure, which includes the adaptation to climate change (climate resilience). The note contains guidance on the methodology of assessments, include the role within EIAs. The methodology for the CCR assessment detailed in **Section 14.8** draws from principles within this guidance.
Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation[52]	This IEMA guidance provides a framework for the effective consideration of CCR and adaptation in the EIA process. The methodology for the CCR assessment detailed in **Section 14.8** draws from principles within this guidance.
UK Climate Risk Independent Assessment 2021[4] **and UK Climate Change Risk Assessment 2022**[3]	The UK Government Third Climate Change Risk Assessment (CCRA3) 2022 fulfils the requirement under the Climate Change Act 2008 for the Government to produce a five-yearly assessment of the risks for the UK of the current and predicted impacts of climate change. The methodology for the CCR assessment detailed in **Section 14.8** draws from principles within the CCRA.

[46] Defra/Met Office (2018). UK Climate Projections 2018.
[47] MetOffice (2019). UKCP18 Science Overview Report.
[48] MetOffice (2019). UKCP18 Land Projections: Science Report.
[49] MetOffice. UKCP18 Factsheets.
[50] ISO (2021). ISO 14091:2021 Adaptation to climate change — Guidelines on vulnerability, impacts and risk assessment.
[51] Commission Notice – Technical guidance on the climate proofing of infrastructure in the period 2021 – 2017. 2021.
[52] IEMA (2020). IEMA Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation.

Technical guidance	Implications
Climate Change Adaptation Manual (NE751)[53]	The Climate Change Adaptation Manual (NE751) was updated in 2020. It is designed to support practical and pragmatic decision-making on considering climate change adaptation for impacts on habitats, green infrastructure, geology and geomorphology, and access and recreation.

14.4 Data gathering methodology

Desk study

14.4.1 A summary of the desktop data used to inform the assessment is provided in **Table 14.10 Desktop data for climate assessment**.

Table 14.10 Desktop data for climate assessment

Desktop data	Source of desktop data	Details of the information
Emissions factors for transport	Department for Environment, Food and Rural Affairs (Defra)	Emissions factors for traffic have been sourced from the Defra Emissions Factors Toolkit[54].
Energy emissions	BEIS	BEIS 2021 Energy and Emissions Projections (EEP)[55] have been used in the development of the future scenarios for electricity mix along with BEIS 2021 Treasury Green Book Data Tables[56] used for sensitivity analysis.
Emissions factors for methane	Defra	Review of Landfill Methane Emissions Modelling[57].
Waste composition data	Defra	Compositional estimates for local authority collected waste and recycling in England[58] *Note: a sensitivity analysis of GHG emissions as a function of waste composition is included in the ES to reflect the different waste contracts that may be secured* (**Appendix 14A Sensitivity analysis (Volume 6.4)**).
UKCP18	Met Office	UK Climate Projections 2018[59] for the 2030s, 2050s, and 2070s have been presented for the location of the Proposed Development.

[53] Natural England (2020). Climate Change Adaptation Manual (NE751).
[54] Defra (2021). Emissions Factors Toolkit. Version 11.
[55] BEIS (2021). Energy and emissions projections: Net Zero Strategy baseline (partial interim update December 2021).
[56] BEIS (2021). Treasury Green Book – Data Tables 1-19.
[57] DEFRA (2014). Review of Landfill Methane Emissions Modelling (WR1908).
[58] DEFRA (2013). Resource Futures EV0801 National compositional estimates for local authority collected waste and recycling in England 2010/11 (Kerbside Residual).
[59] Met Office (2019). UK Climate Projections 2018.

Desktop data	Source of desktop data	Details of the information
Activity data for GHG assessment	Applicant	Activity data and parameters relating to the Proposed Development have been provided by the Applicant.
Residual Waste Composition Data	Waste and Resources Action Programme (WRAP)	Breakdown of waste streams making-up residual waste for England, surveyed by WRAP in 2017[60], representative of waste fractions to be used as fuel in the Proposed Development.
Residual Waste Composition Data	WRATE (Applicant)	Indicative carbon content and calorific values of main waste types found in waste from WRATE GHG calculator for municipal waste (provided by the Applicant[61]), used to determine related GHG emissions for EfW processes and landfilling.
Residual Waste Composition Data	Zero Waste Scotland	Indicative carbon content and breakdown of residual waste used in EfW facilities from Zero Waste Scotland study[62], for comparative review of waste composition.
Stationary Combustion Emissions Factors	IPCC	IPCC emissions factors for methane and nitrous oxides associated with stationary combustion processes.[63]
Global Warming Potential Factors for Greenhouse Gases	IPCC	IPCC global warming potential (GWP) factors for methane and nitrous oxides, for determining equivalent carbon dioxide emissions.[64]
Emissions factors for fuel use	BEIS	Emissions factors for use of gas oil in the Proposed Development have been sourced from the BEIS GHG reporting conversion factors 2021.[71]
Emissions factors for electricity generation/ offsetting	BEIS	BEIS emissions factors for use of UK Grid average electricity generation, as alternative to EfW or landfill gas (LFG).[65]
Emissions factors for heat generation offsetting	BEIS	Emissions factors for use of natural gas to generate heat as alternative to supply of heat from EfW Combined Heat and Power (CHP) capacity, have been sourced from the BEIS GHG reporting conversion factors 2021[71] for sensitivity analysis.
Data on domestic freight transport	Department for Transport (DfT)	Goods lifted and moved by commodity and length of haul.[66]

[60] WRAP (2020). National Municipal Waste Composition, England 2017, Table 3.
[61] WRATE (2011), Greenhouse Gas Calculator for Municipal Waste. WRATE v2. (provided by the Applicant).
[62] Zero Waste Scotland, (2020), The climate change impacts of burning municipal waste in Scotland - Technical Report, Table 2 The estimated composition and carbon content of municipal waste in Scotland in 2018.
[63] IPCC (2006). IPCC Guidelines for Greenhouse Gas Inventories, Vol 2, table 2.2 Default Emissions Factors for Stationary Combustion in the Energy Industries...
[64] IPCC (2014), Anthropogenic and Natural Radiative Forcing,.
[65] BEIS (2021). Fuel Mix Disclosure Data Table 2020-2021.
[66] DfT (2021). TSGB0430 (RFS0105): Goods lifted and moved by commodity and length of haul.

Desktop data	Source of desktop data	Details of the information
Data on distance travelled by trip purpose	DfT	Average number of trips, miles and time spent travelling by trip purpose in England.[67]
Data on settlement population size by local authority	Office for National Statistics (ONS)	2011 Census: Population and Household Estimates for the United Kingdom.[68]
Data on settlement population size by local authority	City Population	Population statistics for countries, administrative divisions, cities, urban areas and agglomerations.[69]
Vehicle Fleet Composition Projection	National Atmospheric Emissions Inventory (NAEI)	Data projections on vehicle fleet composition in the UK.[70]
Emissions factors for water use	BEIS	Emissions factors for use of water have been sourced from the BEIS GHG reporting conversion factors 2021.[71]
Quantities of different waste types used to estimate material resource required for the project	Building Research Establishment (BRE)	SmartWaste Waste Benchmark Calculator (2019)[72] data from query submitted on BRE Smartwaste 21/03/2019 for civil engineering.
Wastage rates used to determine the material quantities based on the amount of waste	WRAP	Net Waste Tool (2008)[73] wastage rates.
Embodied carbon of construction materials	Circular Ecology	The Inventory of Carbon and Energy (ICE) Database[74] carbon factors.
Embodied carbon of construction materials	BEIS	BEIS 2021 emission factors[71] to determine the embodied carbon of materials.
Construction process emissions	Royal Institution of Chartered Surveyors (RICS)	RICS'[75] construction KPI for process emissions of 1,400 $kgCO_2e$ per £100,000 construction cost.
Emissions factors for waste recycling and disposal	BEIS	Emissions factors for waste (Incinerator Bottom Ash (IBA) and Air Pollution Control residues (APCr)) recycling and disposal have been sourced from the BEIS GHG reporting conversion factors 2021.[71]

[67] DfT (2021). NTS0403: Average number of trips, miles and time spent travelling by trip purpose: England.
[68] ONS (2012). 2011 Census: Population and Household Estimates for the United Kingdom.
[69] City Population.
[70] NAEI (2019). Vehicle fleet composition projections (Base 2019r).
[71] BEIS (2021). Greenhouse gas reporting: conversion factors 2021.
[72] BRE (2019). SmartWaste Waste Benchmark Calculator data from query submitted 21 March 2019.
[73] WRAP (2008). Net Waste Tool: Guide to Reference Data, Version 1.0.
[74] Circular Ecology (2019). Embodied Carbon – The ICE Database.
[75] RICS (2017). Whole life carbon assessment for the built environment.

Desktop data	Source of desktop data	Details of the information
GHG emissions associated with the avoided emissions	BEIS	Energy statistics produced by BEIS and published in DUKES 2021[76] have been used to calculate GHG emissions associated with the avoided emissions.

Climate change projections

14.4.2 The UKCP18 data is recognised as a robust source of information on the UK's future climate and is considered as the de facto climate projections for use in climate change impact and adaptation assessment in the UK.

14.4.3 The UKCP18 'Representative Concentration Pathway (RCP) 8.5 scenario'[77] for the 2030s (2020 – 2039), 2050s (2040 – 2059), and 2070s (2060 – 2079) projections at the 10%, 50% and 90% probability level has been used to determine the future baseline for the climate variables presented in **Table 14.11 UKCP18 data.**

14.4.4 UKCP18 provides a range of different climate data available at different scales. For all climate variables, preference has been given to the UKCP18 probabilistic projections at 25km as these have more limited sampling of uncertainties and are therefore the preference for future risk assessments[78]. The most representative 25km UKCP18 grid square for the Proposed Development provided the relevant climate data for the CCR assessment.

14.4.5 For some climate variables (notably wind and snowfall), climate data is not available within the 25km probabilistic projections. Regional data (12km) is available which better represents local effects and therefore wind and snowfall data can be extracted. However, for the purposes of this assessment, qualitative literature has been utilised, due to the uncertainties mentioned above. Full details of the use of qualitative literature and the uncertainties of the regional data is contained within **Appendix 14B Assumptions and limitations (Volume 6.4).**

14.5 Baseline

Current baseline

GHG emissions

14.5.1 The GHG emissions associated with the operation of the facility currently on the EfW CHP Facility Site are not quantified. The assessment is based on a reasonable worst-case scenario and comparison with the future baseline scenario whereby residual waste processed at the EfW CHP Facility would otherwise continue to be sent to landfill. The change in GHG emissions associated with the Proposed Development are contextualised against the UK carbon budgets and GHG emissions policy objectives at national, regional and local scales. Therefore, an

[76] BEIS (2021). Digest of UK Energy Statistics (DUKES) 2021.
[77] This scenario for climate projections is referred to as the 'high emissions' scenario based on continued emissions rate from 'business-as-usual'. It is considered the conservative projection to be used in such assessments.
[78] Met Office (2021). Probabilistic Projections.

assessment of the change in GHG emissions arising from current site operations to the Proposed Development is not required. As reported in **Appendix 14A Consultation and Stakeholder engagement (Volume 6.4)**, this was stated at the EIA Scoping stage. PINS also agreed that impacts from a change in land-use are not anticipated to result in significant effects.

Climate change resilience

14.5.2 A review of published current and historical regional weather data in the location of the Proposed Development was completed to establish the baseline for the CCR and adaptation assessment.

14.5.3 In addition, a Flood Risk Assessment (FRA) (**Appendix 12A Flood Risk Assessment (Volume 6.4)**) has been undertaken to determine baseline conditions across the Proposed Development's Study Area and to inform conceptual and numerical models of flooding.

14.5.4 The Met Office makes monthly data available for a selection of historic stations. The closest weather station to the Proposed Development, with data available, is located around 47km south of the Proposed Development at the National Institute of Agricultural Botany (NIAB). During 2019, the highest temperature ever recorded in the UK was confirmed to be 38.7°C at this station. Current climate conditions are described in the Met Office Eastern England: Climate[79] report which provides a regional climate summary for the east of England based on the latest 30 year averaging period of 1981 – 2010[80]:

- Mean annual temperature varies from around 9.5°C to just over 10.5°C;
- January and February are the coldest months, with mean daily minimum temperatures across the region close to 1°C;
- Mean daily maximum temperature range from just over 6°C to 8°C during the winter months (December, January and February) and from 20°C to 23°C in the summer months (June, July and August);
- Sea temperatures off the coast of eastern England vary from 5-6°C in February and early March to 15-16°C in August;
- Average number of days with air frost (when temperatures at 1.25 m above the ground level are below 0°C), vary from less than 30 to about 55 days per year;
- Annual rainfall is typically less than 700 mm per year and the Eastern England region is one of the driest areas in the country;
- There are on average, around 30 rain days (rainfall greater than 1 mm/24 hr) in winter (December, January and February) and less than 25 days in summer (June, July and August);
- Thunderstorms can make a significant contribution to total annual rainfall with an average of 15 days of thunder per year, although there is considerably variability

[79] Met Office (2016). Eastern England: climate.
[80] The data for the 30-year climate period 1991 – 2020 is now available from the Met Office however, due to UKCP18 presenting climate data against the baseline 1981 – 2000, the climate period 1981 – 2010 has been chosen to represent the climate baseline.

from year to year, including a minimum of two days in 1997 up to 22 days in 1999;

- There are six to eight days each year with hail;
- The average number of days with snow falling each year ranges from under 20 to over 30. The average number of days with snow lying varies from about 6 to 15;
- On average, the number of days with snow falling varies from about 20 – 35 days per winter; and
- The average number of days with gale force winds (wind speeds attains a mean value of 34 knots or more over any period of 10 minutes) is 2 to 5 days per year.

Future baseline

GHG emissions

14.5.5 There are a number of national and regional/local market and policy trends that are likely to lead to carbon emission reductions in the future which are beyond the control of the Proposed Development. Examples include the decarbonisation of power generation and the reduction in the amount of food in municipal waste. In order to provide a 'like for like' comparison, the assessment is based on a comparison of the 'with Proposed Development' case to the 'without Proposed Development' case. In both cases, the assumed market and policy trends are the same.

14.5.6 The 'without Proposed Development' case is the baseline and provides the basis for comparison against which net changes in GHG emissions can be established. The future baseline includes the effect of national and regional/local policy and market trends and assumes that, without the Proposed Development, residual waste arisings are landfilled over the same time period as the Proposed Development would be operational (2026 – 2066). The GHG emissions for the 'without Proposed Development' case have been calculated assuming waste is collected and transported to available landfill sites and the waste is completely decomposed once landfilled.

14.5.7 The **Waste Fuel Availability Assessment (Volume 7.3)** identifies that landfill disposal is the reasonable alternative for the management of residual waste proposed to be used at the EfW CHP Facility. The Waste Fuel Availability Assessment also identifies that some residual waste is incorporated in exports of Refuse Derived Fuel (RDF) to northern continental Europe (Netherlands and Germany) and Scandinavia (Sweden, Norway and Denmark), but highlights that RDF exports have been reducing due to recent tax changes[81] and the increase in the price of haulage making this disposal route a less financially viable option. Additionally, UK Government policy[22] is focused upon applying the proximity principle (i.e., managing waste at a location as close as reasonably possible to

[81] The Netherlands implemented the RDF tax which is a €32-per-tonne (£28.75) tax on the import of all foreign waste for incineration. This came into effect on 1 January 2020. Norway introduced a mandatory waste incineration tax of NOK192 (£16) per tonne of fossil-based CO_2, which has been levied on waste delivered to plants in Norway. This came into effect on 1 January 2022.

where waste is generated). Therefore, this chapter considers a 'without Proposed Development' case where waste is collected and transported to available landfill sites.

14.5.8 The emissions for the future baseline 'without Proposed Development' case are calculated based on the methodology described in **Section 14.8** and presented in **Section 14.9**.

Climate change resilience

14.5.9 UKCP18 has been used to provide projections for future climate scenarios and trends in the Study Area to form the future baseline.

14.5.10 UKCP18 provides probabilistic projections of climatic variables (presented in **Table 14.11 UKCP18 data**). For the purposes of this chapter, the future baseline for the CCR assessment covers the timescales for the construction phase, the Proposed Development's operational life span of 40 years from the opening year and the decommissioning phase. The maintenance and aftercare period of biodiversity and landscape planting following construction of the Proposed Development is also incorporated into these timeframes. Therefore, the UKCP18 projections for climate variables have been analysed for the selected 20-year time periods of 2020 – 2039 (2030s), 2040 – 2059 (2050s), and 2060 – 2079 (2070s).

14.5.11 The majority of the data which is provided to demonstrate the future climate are anomaly values, which represent the degree of change relative to a baseline. Within UKCP18 this baseline is 1981 – 2010.

Table 14.11 UKCP18 data

Climate variable	Time period and projected change[82]				
		2030s	2050s	2070s	Trendline[83]
		2020 – 2039	2040 – 2059	2060 - 2079	
Mean temperature change (Summer) (°C)	10%	0.38	0.85	1.18	
	50%	1.22	2.26	3.41	
	90%	2.11	3.72	5.82	
Mean temperature change (Winter) (°C)	10%	-0.05	0.42	0.73	
	50%	0.93	1.63	2.46	
	90%	1.93	2.92	4.21	

[82] UKCP18 science reports, key messages, maps and graphs uses a 20-year baseline period of 1981 – 2000 to present the projected change in climate variables associated with climate change.
[83] Trendline is indicative of direction of travel but is not to scale or indicative of magnitude of change.

Climate variable	Time period and projected change[82]				
		2030s	2050s	2070s	Trendline[83]
		2020 – 2039	2040 – 2059	2060 - 2079	
Maximum temperature anomaly (Summer) (°C)	10%	0.21	0.79	1.12	
	50%	1.33	2.55	3.89	
	90%	2.56	4.44	6.8	
Minimum temperature anomaly (Winter) (°C)	10%	-0.12	0.31	0.67	
	50%	0.86	1.59	2.42	
	90%	1.9	3.05	4.37	
Mean precipitation change (Winter) (%)	10%	-4.6	-4.83	-1.74	
	50%	5.22	8.27	14.29	
	90%	15.72	21.93	31.1	
Mean precipitation change (Summer) (%)	10%	-29.89	-41.03	-55.39	
	50%	-7.09	-17.87	-25.76	
	90%	16.52	5.9	4.12	
1-day total winter precipitation (mm)	10%	23.2	23.89	24.61	
	50%	25.62	26.97	28.72	
	90%	28.35	30.57	33.6	
1-day total summer precipitation (mm)	10%	36.66	35.84	34.05	
	50%	43.43	43.54	43.43	
	90%	51.6	53.05	55.91	

14.5.12 The key results describing climate variables that may impact the Proposed Development are summarised below:

- Climate model probabilistic projections show that mean summer temperatures are very likely to increase in the future, with an expected increase of around 3.41°C from the baseline by the 2070s (2060 – 2079) (50th percentile and RCP8.5). Summer maximum temperature is very likely to increase in the future, with an expected increase of 3.89°C from the baseline by 2070s (2060 – 2079) (50th percentile and RCP8.5). For context, the 90th percentile shows a maximum temperature increase of 6.80°C by 2070s.
- Mean winter temperatures are also very likely to increase in the future. Winter temperatures are projected to largely increase from the baseline throughout the lifetime of the Proposed Development to the 2070s. By the 2070s the mean winter temperature is expected to increase by 2.46°C (50th percentile and RCP8.5).
- Summer precipitation is likely to decrease in the future, by up to 26% by 2070s (50th percentile, RCP8.5), whilst winter precipitation is likely to increase by 14% (50th percentile, RCP8.5). For contrast, the 90th percentile figure shows a 55% decrease in summer precipitation by the 2070s. This gives rise to the region becoming at risk of prolonged drought conditions.
- There is little change in the amount of precipitation in summer rainfall events (one-day total mm, 50th percentile, RCP8.5) and a slight increase in the amount of precipitation in winter rainfall events from the baseline throughout the lifetime of the Proposed Development to the 2070s.
- By the period 2061 – 2080 the regional and local projections show a decrease in falling and lying snow across the UK compared with the baseline (RCP8.5). In the East of England, both mean snowfall and mean lying snow are anticipated to decrease between 80-100%, averaged across all members of the local and regional climate models.[84]
- There is no clear trend in the projections for mean wind speeds when utilising the probabilistic climate projections, and it is considered very unlikely that large changes will be observed in the future in mean annual wind speeds. However, winds associated with major storm events are known to have major implications for infrastructure in terms of damage and disruption[85]. A review of the qualitative literature, namely those within **Table 14.9 Technical guidance for CCR assessment**, was used which concludes that there is projected to be an increase in near surface wind speeds in the winter months, notably over the second half of the century, which accompany the increase in frequency of winter storms. This increase in the speeds, however, is modest[85].
- Sea level rise over the coming centuries may affect tidal characteristics, and extreme sea levels will increase due to the rise in mean sea level.[86]. This trend is considered within the CCR assessment when combined with local information on sea defences and coastline structure.

[84] Met Office (2021) UKCP18 Factsheet: Snow.
[85] Met Office (2021). UKCP18 Factsheet: Wind.
[86] Met Office (2021). UKPC18 Factsheet: Sea level rise and storm surge.

14.6 Scope of the assessment

Spatial scope

GHG emissions

14.6.1 The spatial scope of GHG emissions from the Proposed Development is defined as follows:

- The impact of GHG emissions is to drive climate change which, by definition, is global in nature and therefore the assessment *Receptor* is the whole planet.
- GHG emissions from the Proposed Development will impact (adversely or beneficially) on the UK's ability to reduce national emissions and to meet commitments to being carbon net zero by 2050. The *magnitude* of changes in GHG emissions as a result of the Proposed Development are therefore assessed with reference to national policy and national emissions reductions. This assessment is complemented by a qualitative assessment of the change in emissions in the context of regional/local emissions and regional/local policies where applicable.
- Waste that would be sent to the Proposed Development for treatment will be sourced from local and regional Waste Planning Authorities (WPA), including industries and commercial entities located within the waste authority areas. The Proposed Development will impact (adversely or beneficially) on the ability of each of these WPA to meet their own targets and commitments to reducing GHG emissions. The *magnitude* of changes in GHG emissions as a result of the Proposed Development can be assessed with reference to relevant WPA policies and emissions reductions.

14.6.2 Waste would be sourced from different local and regional WPA and different industries and commercial entities over the lifetime of the Proposed Development. The magnitude of change in GHG emissions is therefore determined with reference to national policy to provide a consistent assessment of significance and with reference to regional and local policies for context only.

Climate change resilience

14.6.3 The spatial scope of the assessment of the CCR covers the area of the Proposed Development, including the EfW CHP Facility, CHP Connection, the Temporary Construction Compound (TCC), Access Improvements, Water Connections, and the Grid Connection. Interdependencies outside the Order limits have also been assessed, such as the surrounding highways network and electricity provision, for example the wider UK power network.

Temporal scope

14.6.4 For the purposes of the EIA, the projected construction period is three years (2023 – 2026), the operational life of the Proposed Development is 40 years (2026 – 2066), and the decommissioning phase is anticipated to be one year (2066 – 2067).

GHG emissions

14.6.5 The temporal scope of the assessment of GHG emissions is consistent with the period over which the Proposed Development would be carried out and therefore covers the construction, operation and decommissioning periods.

14.6.6 GHG emissions from the construction phase fall within the fourth (2023 to 2027) carbon budget. GHG emissions from the operation phase of the Proposed Development will fall into the fourth, fifth (2028 to 2032) and sixth (2033 to 2037) carbon budgets and subsequent future budgets once set through from 2038 and beyond. GHG emissions from the decommissioning of the Proposed Development will fall entirely within future budgets once set. The assessment also considers the impact of the Proposed Development on the achievement of the 2050 net zero target to which future carbon budgets will be aligned.

Climate change resilience

14.6.7 The temporal scope of the CCR assessment is consistent with the period over which the Proposed Development would be carried out and therefore covers the construction, operation and decommissioning periods. Therefore, the climate periods analysed are the 2020 – 2039 (2030s), 2040 – 2059 (2050s), and 2060 – 2079 (2070s).

14.6.8 The biodiversity and landscape planting following the completion of the construction period includes for Biodiversity Net Gain (BNG) contributions delivered within the Proposed Development. These will be subject to a minimum 30-year management period.

Potential Receptors

GHG emissions

14.6.9 GHG emissions have a global effect rather than directly affecting any specific local Receptor to which a level of sensitivity can be assigned. The global climate is the only Receptor for the GHG emissions assessment. The Receptor has a high sensitivity, given the severe consequences of global climate change and the cumulative contributions of all GHG emission sources.[36]

Climate change resilience

14.6.10 Receptors for consideration within the CCR assessment can be grouped into the following:

- Building and infrastructure Receptors i.e., the project assets, both temporary and permanent, throughout the lifecycle of the project;
- Human health Receptors i.e., construction workers, maintenance staff; and
- Environmental Receptors i.e., the natural environment such as habitats and species associated with any landscaping and biodiversity planting.

14.6.11 The Proposed Development description contained with **Chapter 3: Description of the Proposed Development (Volume 6.2)** and discussions with the project team

has identified the following Receptors to be considered within the CCR assessment, as shown in **Table 14.12 Receptors considered within the CCR assessment.**

Table 14.12 Receptors considered within the CCR assessment

Receptor group	Receptor	Project stages considered
Building and infrastructure	Infrastructure such as critical equipment, substation, cabling	Construction, operation and decommissioning
	Buildings such as the administration building, the EfW CHP Facility	Construction, operation and decommissioning
	Internal and external access roads	Construction, operation and decommissioning
	Materials, plant and equipment (temporary works)	Construction and decommissioning
	Drainage assets	Construction, operation and decommissioning
	Third party buildings and infrastructure which are interdependent of the Proposed Development and not within the control of the Proposed Development, for example the wider Highways Network, National Grid, recycling or landfill facilities, etc.	Construction, operation and decommissioning
Human health	Site operatives	Construction, operation and decommissioning
Environmental	Water bodies including groundwater	Construction, operation and decommissioning
	Restoration and habitat creation	Operation and maintenance

Likely significant effects

GHG emissions

14.6.12 The GHG emissions Receptor that has been taken forward for assessment is summarised in **Table 14.13 GHG emissions Receptor scoped in for further assessment.**

Table 14.13 GHG emissions Receptor scoped in for further assessment

Receptor	Relevant assessment criteria	Likely significant effects
Global atmosphere	Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance (2nd Edition)[18]	The Receptor has a high sensitivity, given the severe consequences of global climate change and the cumulative contributions of all GHG emission sources. The assessment is based on a reasonable worst-case scenario and comparison with the future baseline scenario where waste continues to be sent to landfill. The change in GHG emissions associated with the Proposed Development are contextualised against the UK carbon budgets and GHG emissions policy objectives at national, regional and local scales.

Climate change resilience

14.6.13 The CCR Receptors that have been taken forward for construction, operation and decommissioning phase assessment are summarised in **Table 14.14 Receptors and effects considered within the CCR assessment.**

Table 14.14 Receptors and effects considered within the CCR assessment

Climate Impact	Receptor	Potential effect on the Receptors	Phase
Increased daily mean temperatures and frequency and intensity of heat waves	Buildings and infrastructure (temporary works)	Restriction of construction activities during hot weather to avoid affecting the strength and durability of the finished product, e.g., concrete pour or laying of asphalt.	Construction
	Human health	Increased risk of unsafe working environments in hot weather and potential health impacts on workers.	Construction, operation and decommissioning
	Buildings and infrastructure	Thermal loading on structures resulting in failure.	Operation
	Buildings and infrastructure	Increased rate of degradation of access road surface material.	Operation
	Buildings and infrastructure	Overheating of electrical and mechanical equipment leading to failure.	Operation
	Buildings and infrastructure	Risk of cascading failures due to high temperatures, for example overheating of electrical substations	Construction, operation and decommissioning

Climate Impact	Receptor	Potential effect on the Receptors	Phase
		leading to loss of power to the site.	
Increased summer temperatures coupled with decreased summer rainfall leading to drought conditions	Human health	Increased dust creation from construction and decommissioning activities, leading to health impacts on workers.	Construction and decommissioning
	Natural environment	Failure of landscaping and biodiversity planting.	Operation
Decrease in summer rainfall	Buildings and infrastructure	Risk of cascading failures due to drought affecting potable water supply required for plant operations.	Operation
Increased temperatures and decrease in rainfall in the summer months, followed by increased rainfall in winter months leading to changes in soil moisture content	Buildings and infrastructure	Reduction in soil moisture leading to greater compactive effort during construction.	Construction
	Buildings and infrastructure	Shrink swell effects within the soil leading to deterioration of structure foundations.	Operation
Increase in rainfall and sea level rise leading to an increase in the frequency and severity of flood events (from all sources)	Buildings and infrastructure	Overwhelming of site drainage system causing surface water flooding across the site (impacting construction programme or facility operations).	Construction and operation
	Natural environment	Erosion of stockpiled site-won materials and earthworks leading to potential environmental pollution.	Construction
	Human health	Increased risk of slips, trips and falls and unfavourable working conditions.	Construction and operation
	Buildings and infrastructure	Flooding of access roads (impacting construction programme or facility operations).	Construction and operation
	Buildings and infrastructure	Increased rate of deterioration within structures leading to failure.	Operation
	Buildings and infrastructure	Groundwater flooding of below ground waste storage bunker.	Operation

Climate Impact	Receptor	Potential effect on the Receptors	Phase
	Buildings and infrastructure	Water ingress into critical equipment.	Construction and operation
Storm events leading to driving rain, wind, and excessive precipitation.	Buildings and infrastructure (temporary works)	Plant and equipment unable to operate in high winds leading to delays.	Construction
	Buildings and infrastructure	Increased loads on structures leading to collapse.	Operation

14.7 Embedded environmental measures

14.7.1 Environmental measures have been embedded into the Proposed Development and **Table 14.15 Summary of the embedded environmental measures and how these influence the climate assessment** outlines how these embedded measures will influence the climate assessment.

Table 14.15 Summary of the embedded environmental measures and how these influence the climate assessment

Receptor	Changes and effects	Embedded measures and influence on assessment
Global climate	The cumulative GHG emissions over the design life of the Proposed Development are contextualised against the relevant national climate targets (complemented by an assessment against local targets, where relevant), aims and budgets.	The Proposed Development will be required under its Environmental Permit to seek continuous improvement in energy efficiency and to provide reports to the Environment Agency. The following high-level options have been applied and developed when seeking to reduce GHG emissions on the Proposed Development: 1. Avoid and prevent: maximise potential for reusing or refurbishing materials, where available, to encourage circular economy processes and explore alternative lower carbon options to deliver the Proposed Development's objectives. 2. Reduce: apply low carbon solutions (including technologies, materials and products) to minimise resource consumption during the construction, operation and during decommissioning; and construct efficiently: use techniques (i.e., during construction, operation and decommissioning) that reduce resource consumption over the life cycle of the Proposed Development.

Receptor	Changes and effects	Embedded measures and influence on assessment
		The Proposed Development has been conceived and designed with CHP in mind. The incineration process itself will generate steam that will be used to drive steam generators for electricity generation. Further heat recovery can be secured by the export of heat in the form of steam to off-site customers such as local industries.
		The Proposed Development will be carbon capture retrofit ready with land set aside for a CCS facility. However, the Application does not include the construction and operation of the carbon capture technology within the Proposed Development.
		Measures to reduce air pollutant emissions from construction plant and equipment, detailed in the **Outline Construction Environmental Management Plan (CEMP) (Volume 7.12)** will offer mitigation of construction GHG emissions associated with plant and equipment. The use of efficient and well-maintained plant and equipment and using mains electricity, if available, rather than diesel-fuelled portable generators, will reduce direct and indirect GHG emissions from fuel and energy consumption.
CCR Receptors	Buildings and infrastructure	The Proposed Development will be designed to be resilient to impacts arising from current weather events and climatic conditions, and designed in accordance with current planning, design and engineering practice and codes including the use of relevant materials.
	Buildings and infrastructure	An extensive lightning protection system will be included in the design of the Proposed Development where required.
	Human health	The Contractor(s) will ensure that the relevant measures within the **Outline CEMP (Volume 7.12)** and health and safety protocols and procedures are implemented. As appropriate, method statements will consider extreme weather events where risks have been identified.
	Building and infrastructure, Environment	A FRA has been conducted as part of the EIA (**Appendix 12A Flood Risk Assessment (Volume 6.4)**) and all necessary embedded measures will be incorporated into the Proposed Development design to ensure drainage systems are built with consideration for resilience to climate change.

14.8 Assessment methodology

14.8.1 The generic project-wide approach to the assessment methodology is set out in **Chapter 4: Approach to the EIA (Volume 6.2)**, and specifically in **Sections 4.7** to **4.10**. However, whilst this has informed the approach that has been used in this climate assessment, it is necessary to set out how this methodology has been applied, and adapted as appropriate, to address the specific needs of this climate assessment.

GHG emissions

14.8.2 The GHG emissions impact assessment considers the significance of the Proposed Development's contribution to UK GHG emissions and the Government's ability to achieve its carbon reduction targets to meet the relevant carbon budgets set by the Climate Change Act 2008 (as amended)[1].

14.8.3 All relevant carbon budgets that have been legislated have been considered in the GHG assessment. The timescale of these budgets covers the construction period and some of the operational period only. The assessment also considers the impact of the Proposed Development on the achievement of the 2050 net zero target to which future carbon budgets will be aligned. The total UK budgets are detailed in **Table 14.16 UK carbon budgets**.

14.8.4 Reporting GHG emissions from the Proposed Development in the form of tCO_2e allowed the emissions of the six key GHGs from the Kyoto Protocol Reference Manual[87] to be accounted for: CO_2, CH_4, N_2O, F-gases (HFCs and PFCs), SF_6 and NF_3.

Table 14.16 UK carbon budgets

Budget	Carbon budget level (million tCO_2e)	Reduction below 1990 levels
4th Carbon Budget (2023 to 2027)	1,950	51% by 2025
5th Carbon Budget (2028 to 2032)	1,725	57% by 2030
6th Carbon Budget (2033 -2037)	965	78% by 2035
Net Zero Target	0	100% by 2050[88]

Quantification of GHG emissions

14.8.5 The approach to quantifying GHG emissions from the construction, operation and decommissioning of the Proposed Development has been undertaken in line with

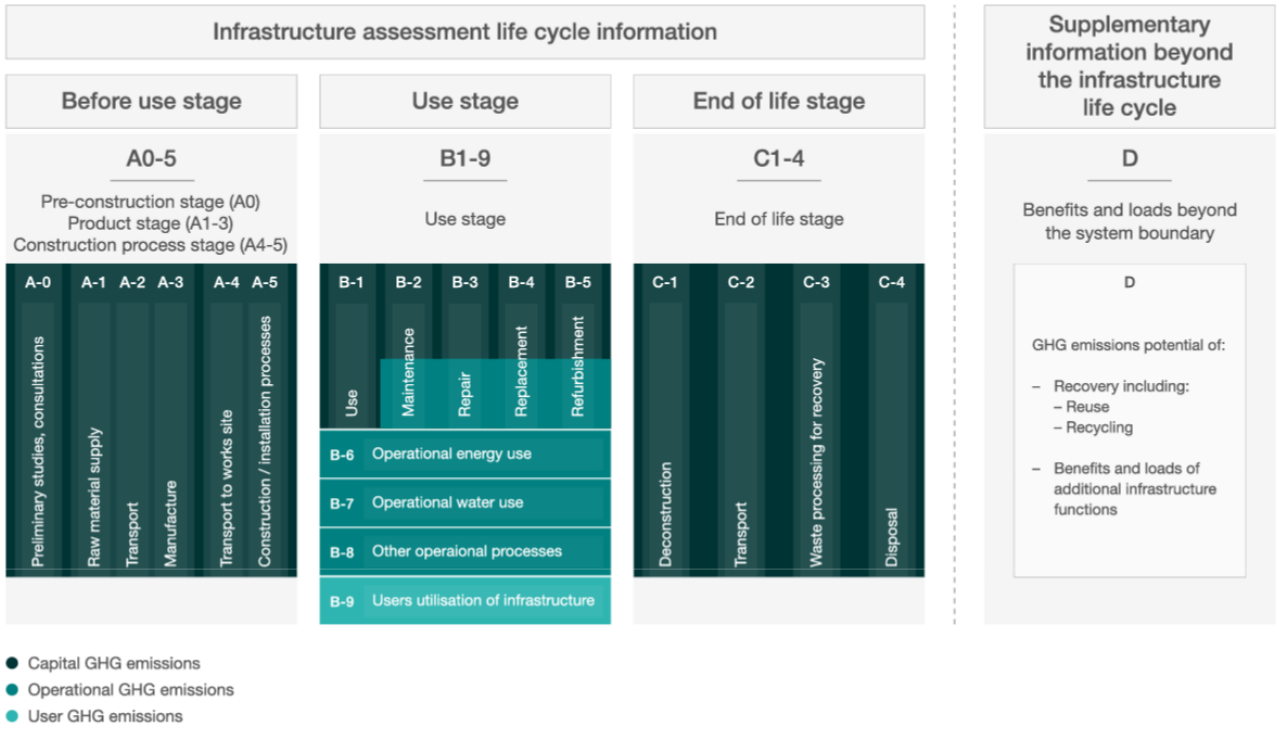
[87] UNFCCC, (2008). Kyoto Protocol Reference Manual on accounting of emissions and assigned amount.
[88] The Climate Change Committee state that sector emissions from waste can be reduced from today's levels by 75% by 2050.

the latest IEMA guidance[36] for assessing GHG emissions and the infrastructure life-cycle modules set out in PAS 2080: Carbon Management Infrastructure[37] presented in **Graphic 14.1 Infrastructure life cycle stages.**

14.8.6 GHG emissions associated with the emissions sources described are generally calculated using the following equation:

$$Activity\ data\ X\ GHG\ emissions\ factor = GHG\ emissions\ value$$

Graphic 14.1 Infrastructure life cycle stages



'With Proposed Development' case

14.8.7 **Table 14.17 Life cycle stages in the 'with Proposed Development' case** outlines the Proposed Development's life cycle stages and the associated sources of GHG emission data that were quantified to develop the 'with Proposed Development' case. The GHG assessment considered the level of certainty of future activity.

Table 14.17 Life cycle stages in the 'with Proposed Development' case

Phase of Proposed Development	Main stage of Proposed Development life cycle	Sources of GHG emissions	Included in ES
Pre-construction	A0 – Pre-construction	This phase represents preliminary studies and works, for example strategy and brief development, design efforts, EIA and cost planning. Most, if not all, of these functions will be largely office-based functions contributions from across the value chain.	Scoped out

Phase of Proposed Development	Main stage of Proposed Development life cycle	Sources of GHG emissions	Included in ES
		In this case carbon emissions might normally be associated with energy use and transportation demands. It is important to note that the COVID-19 pandemic has resulted in a reduction in transport movements and therefore GHG emissions related to pre-construction stage have been scoped out from the assessment.	
	A0 – Pre-construction	It is considered that GHG emissions from site clearance prior to construction are likely to be negligible and not significant, therefore this activity is not considered within the assessment.	Scoped out
Construction	**A1 – A2 – A3 – Raw materials supply, transport and manufacture**	**Embodied GHG emissions associated with the raw material assets required to construct the Proposed Development.**	**Included**
	A4 – Construction transport	**Transport of construction materials resources and equipment from point of purchase to the works site. Commuting of workforce during construction.**	**Included**
	A5 – Construction process stage	**Emissions associated with construction and installation processes (including fuel and electricity consumption) of the temporary works, ground works, landscaping and permanent works. Emissions associated with site water demand.** **Waste management activities (transport, processing, final disposal) associated with waste arising from the Proposed Development.**	**Included**
	A5 – Construction process stage	PINS has agreed that emissions associated with land use change are usually calculated on a national level. It is expected that the changes in land use type associated with the Proposed Development will be negligible and not likely to be significant, and so have not been calculated as part of the assessment.	Scoped out
Operation	B1 – Boundary of use stage – installed products and materials	Called 'Use' this represents the carbon emitted directly from the fabric of products and materials once they have been installed as part of infrastructure and it is in normal use. At this stage of the design, it is not anticipated that any of the materials used in the construction of the Proposed Development will be capable of being 'regenerative', in that they absorb carbon dioxide from the atmosphere.	Scoped out

Phase of Proposed Development	Main stage of Proposed Development life cycle	Sources of GHG emissions	Included in ES
	B2 – B5 – Maintenance, repair, replacement and refurbishment	**Represents the works activities and new materials for the maintenance, repair, replacement and refurbishment of the infrastructure during the use stage/operation of infrastructure.** **This is notionally described as capital carbon. However, depending on organisational interpretation, and the way that such activities are delivered through capital and/or operational expenditure budgets, they might alternatively be described as operational carbon emissions.**	**Included**
	B6 – Operational energy	**Emissions resulting from the energy used by the Proposed Development to enable it to deliver its service during operation. For example, the GHG emissions to produce energy from waste as well as all auxiliary inputs to the incinerator, based on the processes described in Chapter 3: Description of the Proposed Development (Volume 6.2) in addition to the consumption of electricity from energy grids. The parasitic load has been excluded from this assessment to avoid double counting of GHG emissions.**	**Included**
	B7 – Operational water	**Emissions resulting from the consumption of water required by the Proposed Development to operate and deliver its service.**	**Included**
	B8 – Other operational processes	**Represents other process GHG emissions arising from the Proposed Development to enable it to operate and deliver its service. Emissions associated with the transport of waste to the Proposed Development as well as transport of workforce have been included within the assessment. The assessment also includes waste disposal emissions resulting from the transport of IBA and APCr.**	**Included**
	B8 – Other operational processes	The reprocessing of IBA and any other waste products into recycled materials is not carried out at the EfW CHP Facility Site and GHG emission benefits are therefore not considered attributable to the Proposed Development, and so have not been calculated as part of the assessment.	Scoped out

Phase of Proposed Development	Main stage of Proposed Development life cycle	Sources of GHG emissions	Included in ES
	B9 – User's utilisation	Represents the activities associated with user's utilisation of the Proposed Development during the use stage. This is defined by the principle of control and influence whereby the GHG emissions are B9 (user's utilisation) when they arise from an activity that the user has control over. An example is highway vehicle carbon emissions where the user makes the decision as to which type of vehicle they purchase (petrol, diesel, electric etc.), the route they travel, and the load they carry. Therefore, this stage has been scoped out as it has been considered that the GHG emissions associated to this stage will be negligible and not likely to be significant.	Scoped out
Decommissioning	**C1 – C2 – C3 – C4 – End of life, including deconstruction, transport, waste processing for recovery and disposal**	**For the purpose of the assessment, it has been assumed that the environmental effects associated with the decommissioning phase would be of a similar level to those reported for the construction phase works, albeit with a lesser duration of two years.**	**Included**
General	**D – Benefits and loads beyond the infrastructure life cycle**	**Includes avoided carbon emissions associated with the Proposed Development including potential for re-use, recovery and recycling of materials and/or energy and associated GHG emissions beyond the system boundary. GHG benefits from avoided energy generation have been recorded, excluding the parasitic load.**	**Included**

'Without Proposed Development' case

14.8.8 The 'without Proposed Development' case considers no new infrastructure, and so represents the operational GHG emissions of landfilling residual waste over the same time period as the Proposed Development would be operational.

14.8.9 The vast majority of GHG emissions in the 'without Proposed Development' case relate to the release of methane from landfill and GHG emissions from waste treatment and transport.

14.8.10 The assessment considers the offset of emissions from the generation of electricity from LFG.

14.8.11 **Table 14.18 Life cycle stages in the 'without Proposed Development' case** outlines the Proposed Development's life cycle stages and the associated sources of GHG emission data.

Table 14.18 Life cycle stages in the 'without Proposed Development' case

Phase of Proposed Development	Main stage of Proposed Development life cycle	Sources of GHG emissions	Included in ES
Pre-construction	A0 – pre-construction	No construction activities will take place and therefore emissions associated to this stage have been scoped out.	Scoped out
Construction	A1 – A2 – A3 - Raw materials supply, transport and manufacture	No construction activities will take place and therefore emissions associated to this stage have been scoped out.	Scoped out
	A4 – Construction Transport	No construction activities will take place and therefore emissions associated to this stage have been scoped out.	Scoped out
	A5 - Construction process stage	No constructions activities will take place and therefore emissions associated to this stage have been scoped out.	Scoped out
Operation	B1 – Boundary of use stage – installed products and materials	Called 'Use' this represents the carbon emitted directly from the fabric of products and materials once they have been installed as part of infrastructure and it is in normal use. The landfill products have not been included within the assessment.	Scoped out
	B2 – B5 – Maintenance, repair, replacement and refurbishment	Represents the works activities and new materials for the maintenance, repair, replacement and refurbishment of the infrastructure during the use stage/operation of infrastructure. These quantities are unknown in the 'without development' case but are expected to be negligible and not significant given the limited infrastructure associated with landfilling.	Scoped out
	B6 – Operational energy	**Emissions resulting from the energy used by landfill sites related to the waste diverted from the Proposed Development.**	**Included**
	B7 – Operational water	Emissions resulting from the consumption of water required by the landfill site to operate and deliver its service related to the waste diverted from the Proposed Development. Water use is associated with onsite welfare facilities or dust suppression and likely to be negligible and not significant.	Scoped out
	B8 – Other operational processes	**Represents other process GHG emissions arising from the landfill to enable it to operate and deliver its service. Emissions associated to the transport of waste diverted from the Proposed Development**	**Included**

Phase of Proposed Development	Main stage of Proposed Development life cycle	Sources of GHG emissions	Included in ES
		have been included within the assessment.	
	B9 – User's utilisation	Represents the activities associated with user's utilisation of the landfill facilities. This stage has been scoped out as it has been considered that the GHG emissions associated to this stage will be negligible and not significant.	Scoped out
Decommissioning	C1 – C2 – C3 – C4 – End of life, including deconstruction, transport, waste processing for recovery and disposal	The end of life of the landfill will not be included within the assessment.	Scoped out
General	**D – Benefits and loads beyond the infrastructure life cycle**	**GHG benefits associated with combustion of LFG to generate electricity have been included.**	**Included**

Assumptions and limitations

14.8.12 Embedded mitigation measures, presented in **Section 14.7**, for reducing GHG emissions through the life cycle of the Proposed Development have been considered in the quantification of emissions.

14.8.13 As the assessment covers the full life cycle of the Proposed Development, emissions factors have been used to characterise conditions throughout the operational phase. Assumptions have been made where emissions factors and projections for conditions throughout the operational phase do not exist. These have been clearly stated in the ES. Assumptions remain in line with published material and the guidance documents reported in **Section 14.3**.

14.8.14 All emissions factors and projections of future conditions have been based on published material and used government statistics where available. These include projections of the carbon intensity of power in the grid, vehicle emissions factors and construction plant efficiency presented within **Section 14.4**.

14.8.15 The waste composition and supply used in the model have been based on the availability of residual waste going to landfill, as identified in the **Waste Fuel Availability Assessment (Volume 7.3)**. To achieve this, the Waste Fuel Availability Assessment considers current targets for waste for landfill diversion. Information on the detailed breakdown of residual waste composition for relevant Waste Planning Authorities is limited in terms of consistency and quality so, for the reasonable worst-

case scenario at this stage, the assessment has used information on residual waste composition available from WRAP's national survey of municipal waste for England in 2017 (published in 2020)[60], which is considered to be representative of waste that would be available for the EfW CHP Facility. The ES also includes a sensitivity analysis of waste composition and GHG emissions (**Appendix 14C –Sensitivity Analysis (Volume 6.4)**).

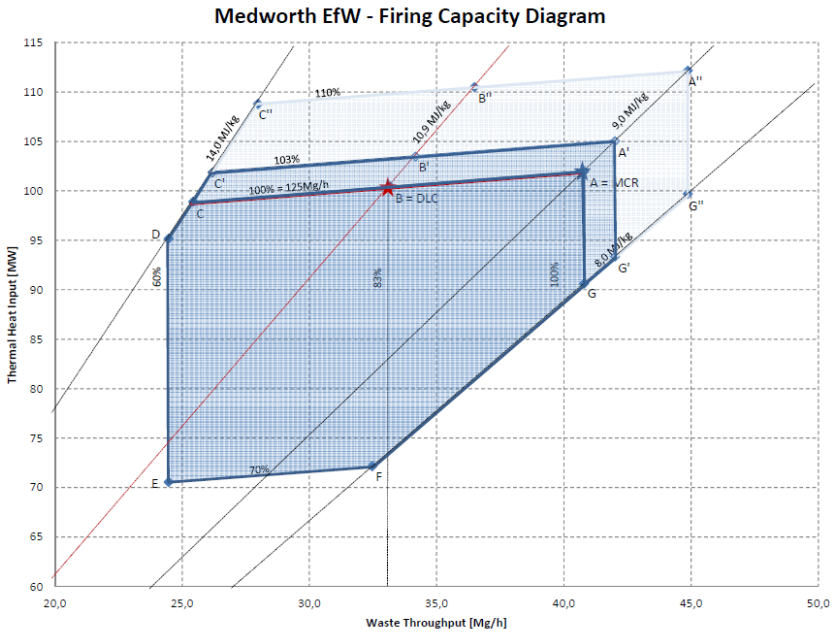
14.8.16 Some of the key assumptions used in the assessment of operational GHG emissions are listed below (a detailed list of assumptions, including emissions factors, is provided in the **Appendix 14B – Assumptions and limitations (Volume 6.4)**).

14.8.17 The following operating parameters have been assumed for the EfW CHP Facility in the GHG assessment:

- Total thermal capacity = 201MW;
- Net electricity generation = 55MWe (allowing for 5MWe parasitic load);
- Net calorific value (NCV) of residual waste = 9.53MJ/kg (based on WRAP waste survey data on composition of residual municipal solid waste[60]);
- Residual waste input = 625,600 tonnes/year;
- Auxiliary burners use gas oil during start-up, shut-down, and operational events; and
- Water usage = 40,000 tonnes per annum (tpa).

14.8.18 The EfW CHP Facility has been designed with a degree of flexibility to accommodate variations in waste that will inevitably occur as deliveries arrive from different locations. In addition to the waste receiving area having capacity for short term handling of waste, the incinerator itself is designed to operate within different ranges of waste throughput (tonnes per hour) due to the variable NCV of the waste itself (Mega Joules per kilogramme). The design restriction is the amount of steam being produced so the facility is operated by varying the volume of waste within the firing capacity to control the amount of steam raised at a set level (**Graphic 14.2: Medworth Firing Capacity Diagram**)

Graphic 14.2: Medworth Firing Capacity Diagram



	Waste Throughput	Thermal Input	NCV
	Mg/h	MW	MJ/kg
A = MCR	40,8	102,0	9,0
B = DLC	33,2	100,5	10,9
C	25,4	98,9	14,0
D	24,5	95,2	14,0
E	24,5	70,6	10,4
F	32,5	72,2	8,0
G	40,8	90,6	8,0
A'	42,0	105,0	9,0
B'	34,2	103,5	10,9
C'	26,2	101,9	14,0
G'	42,0	93,4	8,0
A''	44,9	112,2	9,0
B''	36,5	110,5	10,9
C''	28,0	108,8	14,0
G''	44,9	99,7	8,0

14.8.19 The composition of residual waste used in the assessment is consistent with the facility's firing capacity range and is based on WRAP's national survey of municipal waste for England in 2017[60], identifying the proportion (% by weight) of individual waste streams making up residual MSW from household and commercial sources. This is supported by information in the WRATE GHG calculator for MSW (provided by the Applicant[61]) identifying the typical carbon content (biogenic and fossil carbon) and calorific values of different waste streams. Based on these sources:

- A NCV of 9.53MJ/kg of waste has been determined for residual MSW from household, commercial and industrial sources representative of waste that would typically be available for the EfW CHP Facility, which is within the range of design values for the EfW CHP Facility, and
- A total carbon content of 26.2% by weight is determined for the residual MSW, which aligns with a number of other studies evaluating the carbon content of waste used in EfW facilities:
  - Carbon Trust Report for Cory Riverside EfW Facility[89] = 27% carbon;
  - Defra Carbon Modelling of UK Waste Streams[90] = 20-30% carbon; and
  - Zero Waste Scotland technical report on the climate change impacts of burning municipal waste in Scotland[62] = 25.6% carbon.

14.8.20 As identified in the **Waste Fuel Availability Assessment (Volume 7.3)**, the use of residual waste in the GHG assessment is in line with the types of waste that are expected to be available as fuel for the EfW CHP Facility, in excess of the design input of 625,600 tonnes/year. Based on waste streams that would typically be sent to non-hazardous landfill (or exported from the UK for onward disposal by energy recovery) and the suitability of materials for combustion, the **Waste Fuel**

[89] Carbon Trust (2017). Cory Riverside Energy: A Carbon Case, Carbon Trust Peer Review.
[90] DEFRA (2006), Carbon Balances and Energy Impacts of the Management of UK Wastes, Defra R&D Project WRT 237, Table B1.7 Input Waste Fraction Properties.

Availability Assessment (Volume 7.3) has determined that the following waste categories are representative of the main types of waste that would be available for use as fuel in the EfW CHP Facility (referred to using the relevant LoW (List of Waste) codes):

- 19 12 10 combustible waste (refuse derived fuel);
- 19 12 12 other wastes (including mixtures of materials) from mechanical treatment of wastes;
- 20 03 01 mixed municipal waste; and
- 20 03 07 bulky waste.

14.8.21 A sensitivity analysis is included in the ES (**Appendix 14C – Sensitivity Analysis (Volume 6.4)**) based on different scenarios for future waste composition profiles that may be supplied to the Proposed Development. This sensitivity analysis also considers the likely changes in UK grid electricity generation over the lifetime of the plant.

Determination of significance

14.8.22 Current IEMA guidance[36] states that: "*The crux of significance therefore is not whether a project emits GHG emissions, nor even the magnitude of GHG emissions alone, but whether it contributes to reducing GHG emissions relative to a comparable baseline consistent with a trajectory towards net zero by 2050*".

14.8.23 The significance of GHG emissions associated with the Proposed Development has been evaluated based on the extent to which the Proposed Development materially affects the ability of the UK Government to meet its carbon target and budgets. The scale of the GHG emissions from all sources in the 'with Proposed Development' case has been contextualised within their overall impact on the UK Government's UK carbon target of 'net zero' in 2050 and the UK carbon budgets. Consideration is also given as to whether GHG emissions are appropriately mitigated and compliant with relevant policy.

14.8.24 Note that local objectives, targets and plans for reducing GHG emissions have also been considered for waste authority areas where waste may be sourced. This will vary over the lifetime of the Proposed Development and hence, consideration only is given to the extent to which the Proposed Development affects the ability of local authorities to meet their own net zero visions.

14.8.25 Based on the above, the following statements can be made:

- Higher GHG emissions in the 'with Proposed Development' case than the 'without Proposed Development' case represents an adverse effect.
- Lower GHG emissions in the 'with Proposed Development' case than the 'without Proposed Development' case represents a beneficial effect.

14.8.26 The significance of the GHG emissions from the Proposed Development is determined based on the criteria in **Table 14.19 Significance criteria for the GHG assessment** developed from the IEMA guidance[36]. Major or moderate adverse effects and beneficial effects are considered to be Significant. Minor adverse and negligible effects are considered to be Not Significant.

Table 14.19 Significance criteria for the GHG assessment

Significance	Significance criteria
Major adverse	The Proposed Development does not make a meaningful contribution to the UK Government meeting its carbon budgets/targets. Adverse GHG impacts are not mitigated/do-minimum and are not compliant with requirements of national, regional and local policy.
Moderate adverse	The Proposed Development falls short of fully contributing to the UK Government meeting its carbon budgets/targets. Adverse GHG impacts are partially mitigated and partially meet the requirements of national, regional and local policy.
Minor adverse	The Proposed Development is fully in line with the trajectory of the UK Government meeting its carbon budgets/targets. Adverse GHG impacts are mitigated with good practice design standards and meet the requirements of national, regional and local policy.
Negligible	The Proposed Development has minimal residual GHG emissions and is 'ahead of the curve' for the trajectory of the UK Government meeting its carbon budgets/targets. GHG impacts are mitigated through measures that go beyond good practice design standards and the requirements of national, regional and local policy.
Beneficial	The Proposed Development has net GHG emissions below zero, causing a direct or indirect reduction in atmospheric GHG emissions which has a positive impact on the UK Government meeting its carbon budgets/targets.

Climate change resilience

14.8.27 This section presents the methodology for assessing the likely significant effects of climate change impacts on the construction, operation and decommissioning of the Proposed Development (CCR assessment).

14.8.28 Consideration of climate change impacts within EIA is an area of emerging practice. The approach outlined below has been aligned with the guidance and studies contained within **Table 14.9 Technical guidance for CCR assessment**.

14.8.29 The following key terms and definitions relating to the CCR assessment have been used:

- Trend in climate variable/climate change trend – a weather or climate-related event which has potential to do harm to environmental Receptors or assets. The trend could be acute, for example, increase in frequency of heavy rainfall events or chronic events, such as the increased mean winter precipitation.
- Climate change impact – an impact from a climate variable trend which affects the ability of the Receptor or asset to maintain its function or purpose, for example, water ingress into critical equipment.
- Likelihood – the likelihood of the climate change impact occurring during the phase of the development.

- Consequence – the effect on the Receptor or asset as a result of the climate change impact occurring.

14.8.30 Risk – the result of the likelihood of the climate change impact occurring coupled with the magnitude of the consequence of the impact on the Receptor. The level of risk is assigned a significance level. Existing literature provided information on climate change, such as the UK CCRA[4] along with UKCP18 data outputs for the location of the Proposed Development, has been used to identify potential trends in climate variables that may affect the Proposed Development.

Assumptions and limitations

14.8.31 The CCR assessment has assumed that the Proposed Development will be designed to be resilient to impacts arising from current weather events and climatic conditions, and designed in accordance with current planning, design and engineering practice and codes. This is detailed within the embedded measures (**Section 14.7**) and will form the basis for detail design. The assessment has also identified and considered the existing resilience mitigation measures either already in place or in development for infrastructure and assets.

14.8.32 The probabilistic projections from UKCP18 are presented (see **Section 14.5**) spanning the full temporal period of the Proposed Development i.e., from the start of construction through to end of design life, to include decommissioning.

14.8.33 Climate change, by its very nature, is associated with a range of assumptions and limitations. For example, there is uncertainty in climate models and regarding how global climatic trends will be reflected at the regional scale. The future baseline therefore represents projections under one future scenario and cannot be treated as a prediction. Data for the 10%, 50% and 90% probability levels for the high emissions scenarios have been used in the assessment to highlight uncertainty and ensure a conservative assessment of risk. Leading climate change data from the UKCP18 programme has been used to explore trends and magnitude of change at the regional scale. UKCP18 is the result of over seven years' work by the Met Office's Hadley Centre Climate Programme[91] and over 30 years of work from other contributing organisations. UKCP18 provides the most up-to-date assessment of how the climate of the UK may change over the 21st century.

Determination of significance

14.8.34 Once trends in climate variables were identified and possible climate change impacts considered, the likelihood of the climate change impact[92] occurring was assessed. This has been assessed based on likelihood of the climate change trend occurring combined with the sensitivity of the Proposed Development, using professional judgement. Embedded mitigation measures were also taken into account and a likelihood rating has been assigned as described in **Table 14.20 Indicative scale for the measure of likelihood of the climate impact occurring**.

[91] The Met Office's Hadley Centre Climate Programme is supported by the Department of Business, Energy and Industrial Strategy (BEIS) and the Department for Environment, Food and Rural Affairs (Defra).
[92] The likelihood of a climate change hazard occurring is defined as the probability of some well-defined outcome occurring in the future.

Table 14.20 Indicative scale for the measure of likelihood of the climate impact occurring

Likelihood category	Description (probability and frequency of occurrence)
Very likely	The impact is almost certain to occur during the phase of the project considered
Likely	The impact is considered likely to occur during the phase of the project considered
Possible	The impact is as likely as not to occur during the phase of the project considered
Unlikely	The impact is unlikely to occur during the phase of the project considered, but still could occur at least once
Very unlikely	The impact is highly unlikely to occur during this phase of the project considered and is considered rare

14.8.35 Criteria for assessing consequence for CCR has been defined in **Table 14.21 Indicative scale for the measure of consequence of the climate change impact**. The measure of consequence has been evaluated based on professional judgement and inputs from design teams, it also takes into account the sensitivity of the Proposed Development to the climate hazard.

Table 14.21 Indicative scale for the measure of consequence of the climate change impact

Consequence category	Consequence criteria
Very large	The impact could lead to complete shutdown of operations, loss of the asset, or collapse. There could be single or multiple fatalities and significant harm to the environment with limited prospect of full recovery. Social implications could lead to community protests and high financial implications.
Large	The impact could lead to disruption to activities lasting more than 1 week. There could be major or multiple injuries which could be permanent. Environmental damage could be significant with recovery times over a year and non-compliance with regulations and consents. National and long-term social impacts could be endured. The impact would require extensive mitigation actions.
Medium	The impact could lead to disruption to activities lasting more than 1 day but less than 1 week. There could be moderate environmental damage with wider effects and recovery of up to a year. Moderate cost and social implications which are localised yet long-term. This could lead to a serious injury requiring lost time. The impact would require emergency mitigation actions to be in place.
Low	The impact could lead to disruption to activities lasting less than 1 day. There could be localised environmental impact within the site boundary, localised and temporary social or reputational impacts, and a minor cost implication. This could lead to a minor injury requiring medical treatment. The impact could be rectified through additional mitigation actions to be put in place.

Consequence category	Consequence criteria
Very low	The impact could lead to disruption to an isolated section of activity with limited social, economic and environmental consequences. It could equate to a minor first aid case. The impact could be rectified through usual activity.

14.8.36 The output from the CCR assessment is a risk analysis which is assigned a significance. The measure of significance has been evaluated based upon the matrix provided in **Chapter 4: Approach to the EIA (Volume 6.2)**, **Table 4.1 Significance of evaluation matrix** but amended for likelihood in relation to risk; see **Table 14.22 Definition of risk and significance** below.

Table 14.22 Definition of risk and significance

		Magnitude of change (consequence)				
		Very large	**Large**	**Medium**	**Low**	**Very low**
Likelihood	**Very likely**	Major (Significant)	Major (Significant)	Major (Significant)	Major (Significant)	Moderate (Probably significant)
	Likely	Major (Significant)	Major (Significant)	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)
	Possible	Major (Significant)	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)
	Unlikely	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)
	Very unlikely	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)	Negligible (Not significant)

14.9 Environmental assessment of climate effects

GHG emissions

14.9.1 As described in **Section 14.5**, the 'without Proposed Development' case, whereby the Proposed Development does not go ahead, provides the basis for comparison against which net changes in GHG emissions can be established.

14.9.2 The assessment of GHG emissions in the 'with Proposed Development' and 'without Proposed Development' case is presented here. The net change in GHG emissions is contextualised against relevant national targets.

Construction

14.9.3 There is no construction required in the 'without Proposed Development' case and therefore no emissions. The rest of this sub-section refers to the 'with Proposed Development' case.

R*aw materials supply, transport and manufacture*

14.9.4 The exact bill of materials required to construct the Proposed Development is unknown, so the RICS methodology to calculate embodied carbon[75] along with the ICE Database[74] has been used. The GHG emissions associated with the embodied carbon of material resources needed for the construction of the Proposed Development are estimated to be 35.55ktCO_2e.

Construction transport

14.9.5 Emissions associated with construction transport are based on two-way traffic data provided in **Chapter 6: Traffic and Transport (Volume 6.2)**. The following assumptions have been used.

- The average one-way distance of 99.7km travelled by heavy goods vehicles (HGV) during construction was obtained from DfT dataset on domestic road freight transport by commodity and length of haul[66]. 99.7km was calculated as the average distance travelled to move "Glass, cement and other non-metallic mineral products" and "Metal products".
- The average one-way commuting distance of 14.6km travelled by staff was obtained from DfT dataset on the Average number of trips, miles and time spent travelling by trip purpose in England[67].
- Vehicle emission factors were obtained from the Defra Emissions Factors Toolkit[54] for every year up to 2050. This accounts for introduction of newer vehicles into the fleet in accordance with the NAEI Vehicle Fleet Composition Projection for 2021.

14.9.6 Construction vehicle emissions are provided in **Table 14.23 Construction vehicle emissions**.

Table 14.23 Construction vehicle emissions

Source	Total Vehicle Movements (two-way)	Total distance travelled (km)	Total vehicles emissions (ktCO_2e)
Construction vehicles – HGV	90,934	9,065,361	7.45
Construction vehicles – Car (commuting)	298,031	4,345,287	0.48
Total	-	-	7.93

Construction process stage

14.9.7 Construction process GHG emissions have been estimated on a reasonable and conservative basis using RICS' construction KPI for process emissions per construction cost[75], giving an estimated total GHG emissions of 4.90ktCO_2e. This includes any energy consumption for site accommodation, plant use and the impacts associated with any waste generated through the construction process, its treatment and disposal.

Summary

14.9.8 The total GHG emissions associated with the construction phase of the Proposed Development are estimated to be around 48.38ktCO_2e, of which approximately 73% is embodied carbon associated with the use of materials.

Operation

14.9.9 The Proposed Development will divert waste from landfill, and this is contextualised in the difference in operational emissions from the 'with Proposed Development' and 'without Proposed Development' case. GHG emissions from both assessments are presented here.

14.9.10 In accordance with the **Waste Fuel Availability Assessment (Volume 7.3)**, the type and quantity of waste available as fuel for the Proposed Development will be residual waste that would typically be sent to non-hazardous landfill and would be suitable for combustion.

14.9.11 The assumed composition of residual waste for both the 'with Proposed Development' and 'without Proposed Development' cases is presented in **Table 14.24 Waste composition summary**.

Table 14.24 Waste composition summary

Waste Stream	Residual Waste
Recyclable Paper	5.9%
Card	6.3%
Non-recyclable Paper	8.9%
Dense Plastic	7.8%
Plastic film	8.2%
Textiles	5.5%
Misc. Combustible	9.3%
Misc. Non-Combustible	3.6%
Other Wastes	0.3%
Glass	2.6%

Waste Stream	Residual Waste
Ferrous Metals	2.4%
Non-Ferrous Metals	1.1%
Food Waste	27.0%
Garden Waste	2.7%
Other Organic	2.3%
Wood	2.3%
WEEE	1.1%
Hazardous	0.5%
Fines	2.2%
Net Calorific Value (MJ/kg)	9.53
Total waste input (tonnes/yr)	625,600
Total Carbon (% by weight)	26.2%
Biogenic Carbon (% of Total Carbon)	57.2%
Non-Biogenic Carbon (% of Total Carbon)	42.8%

Without Proposed Development case

Operational energy

14.9.12 Exact details of the operational energy use of the destination landfills for the disposal of waste in the 'without Proposed Development' scenario are unknown. Based upon knowledge of annual energy consumption at closed landfill sites, a reasonable estimate is that it is expected that the GHG emissions over the lifetime period of the Proposed Development for the landfill of 625,600 tonnes of residual waste per year would be approximately 25.04ktCO_2e.

Other operational processes

14.9.13 Net CO_2e emissions for the disposal of waste to landfill, with recovery of LFG used to generate electricity, is based on:

- Equivalent CO_2 emissions from the release of LFG to atmosphere as methane, associated with the decomposition of residual MSW in landfill; and
- Offset of equivalent CO_2 emissions for the generation of electricity from the use of LFG in compression ignition engines.

14.9.14 The assessment of GHG emissions associated with the disposal of waste to landfill in the 'without Proposed Development' case assumes that biogenic carbon in the waste is converted to LFG but only the methane proportion of LFG contributes to

GHG emissions; the fossil (non-biogenic) carbon in the waste is assumed to remain within the landfill and does not contribute to GHG emissions.

14.9.15 The following factors referenced in a Defra report[57] on landfill methane emissions modelling based on a UK scenario, have been used to determine the lifetime GHG emissions for landfill disposal of residual waste, which also allows for the capture of LFG for use in gas engines to generate electricity:

- The percentage of biogenic carbon converted to LFG is 50% of the total biogenic carbon in the residual waste.
- The ratio of methane to carbon dioxide in LFG at UK landfill sites is calculated to be 57:43%.
- A collection efficiency for LFG of 68% (for a subset of modern, large landfill operations in the UK).
- The proportion of collected LFG used in gas engines is 91% with the remaining 9% being flared.
- The proportion of uncaptured LFG released from landfill that is oxidised to CO_2 in the landfill cap is 10% (and therefore excluded from GHG emissions as biogenic CO_2, rather than methane).
- Net electrical efficiency of 36% for compression ignition engines using LFG (including losses for parasitic load).

14.9.16 **Table 14.25 Landfill with electricity generation using LFG: annual GHG emissions** presents the GHG emissions calculated for the 'without Proposed Development' case using landfill.

Table 14.25 Landfill with electricity generation using LFG: annual GHG emissions

Parameter	Residual Waste
Mass of biogenic carbon in residual waste (tonnes carbon)[a]	93,735
Total biogenic carbon converted to LFG @50% (tonnes carbon)	46,867
Methane in LFG released from residual waste (tCH_4)[b]	35,619
Methane in LFG captured for use in gas engines @68% (tCH_4)	-24,221
LFG oxidised to CO_2 in landfill cap @10% of uncaptured methane (tCH_4)	-1,140
Remainder of uncaptured LFG released to atmosphere as methane (tCH_4)	10,258
LFG equivalent CO_2 emissions released to atmosphere (tCO_2e)[c]	287,234
Methane in LFG captured for use in gas engines (tCH_4)	24,221
Methane used in gas engines @ 91% of LFG captured for use (tCH_4)	22,017
Fuel input to LFG engines (GJ)[d]	369,306
Power generated by LFG engines (MWh)	110,085

Parameter	Residual Waste
UK grid CO_2 emissions factor for electricity generation (g/kWh)	182
LFG equivalent CO_2 offset for electricity generation by gas engines (tCO_2e)[e]	20,035
LFG Net emissions (tCO_2e)	267,198
LFG Net emissions ($ktCO_2e$)	267.20

[a] Derived from values for total annual waste input, total carbon % and biogenic carbon % in **Table 14.24**
[b] Based on CH_4:CO_2 ratio of 57:43 and factor of 16/12 for conversion of carbon content to methane[57]
[c] Methane – global warming potential: 28 $kgCO_2e/kgCH_4$[64]
[d] Based on calorific value for methane of 50 MJ/kg and LFG engine efficiency of 36%[57]
[e] Use of LFG in gas engines to generate electricity counts towards avoided emissions for 'without Proposed Development' case

14.9.17 Other operational emissions associated with the 'without Proposed Development' case will arise from transport of waste to landfill. It is assumed that in this case, waste would be transported to the nearest landfill location, therefore the distance travelled is lower than in the 'with Proposed Development' case.

14.9.18 It is assumed that the same number of HGV as in the 'with Proposed Development' case are used to dispose of waste from each WPA into a local landfill. The average distance of 46.9km travelled by HGV vehicles to a landfill was obtained from the DfT dataset on domestic road freight transport by commodity and length of haul, which includes statistics on waste[66]. 'Without Proposed Development' vehicle emissions are provided in **Table 14.26 GHG emissions associated with the "without Proposed Development" emissions.** The workforce commuting emissions are not calculated in this assessment.

14.9.19 The introduction of newer vehicles with lower emissions has been accounted for through the use of the Defra Emissions Factors Toolkit. Although Refuse Collection Vehicles (RCV) may be electrified in future, the use of diesel vehicles has been assumed as a worst-case assumption.

Table 14.26 GHG emissions associated with the "without Proposed Development" emissions

Source	Annual Vehicle Movements (two way)	Annual distance travelled (km)	Average annual vehicles emissions ($ktCO_2e/yr$)
HGV	80,496	3,773,772	2.60

14.9.20 Under the 'without Proposed Development' case, the GHG emissions associated with waste composition and supply, have been estimated based on residual waste going to landfill, as identified in the **Waste Fuel Availability Assessment** (**Table 14.25 Landfill with electricity generation using LFG: annual GHG emissions**, 266.9$ktCO_2e/yr$), and emissions associated with the transport of waste to landfill (**Table 14.26 GHG emissions associated with the "without Proposed Development" emissions**, average 2.60$ktCO_2e/yr$).

Summary

14.9.21 GHG emissions in the 'without development' case are therefore estimated to be on average 270.42ktCO_2e/yr, equal to 10,816.83ktCO_2e over the assessment period of 2026 to 2066. The vast majority of GHG emissions in the future baseline ('without the Proposed Development') relate to the release of methane from landfill. The proportion of GHG emissions from transport will reduce over time as the transport sector continues to decarbonise.

With Proposed Development case

Operational energy

14.9.22 The assessment for the energy use stage of operation of the Proposed Development considers the following aspects in determining annual GHG emissions associated with the use of waste as fuel at the EfW CHP Facility:

- Fossil CO_2 emissions derived from the combustion of non-biogenic carbon in residual MSW, i.e., the material remaining after removal of recyclables (biogenic sources of CO_2 are excluded as this has a neutral carbon burden);
- Equivalent CO_2 emissions for nitrous oxide and methane from the combustion of residual waste (noting that emissions of nitrous oxide and methane are dependent on operating conditions, and that methane is not expected to be generated under normal operating conditions but is included in the assessment to provide a conservative value, based on default emissions factors from IPCC for stationary combustion in energy industries[63]); and
- Equivalent CO_2 emissions for the use of fuel in auxiliary burners during start-up and shut-down events.

14.9.23 **Table 14.27 EfW CHP Facility: annual operational GHG emissions** details the calculated annual operational GHG emissions from the Proposed Development.

Table 14.27 EfW CHP Facility: annual operational GHG emissions

Parameter	Residual Waste
Total waste input (tonnes/yr)	625,600
Total Carbon (% by weight)	26.2%
Non-Biogenic Carbon (% of Total Carbon)	42.8%
Mass of fossil carbon in residual waste (tonnes carbon)[a]	70,142
Fossil derived CO_2 emissions (tCO_2)	*257,187*
N_2O emissions from residual waste combustion[b] (tonnes)	24
Equivalent CO_2 emissions (tCO_2e)[c]	*6,318*
CH_4 emissions from residual waste combustion[d] (tonnes)	179
Equivalent CO_2 emissions (tCO_2e)[e]	*5,007*

Parameter	Residual Waste
Auxiliary Burners – fuel use (litres)[f]	1,745,424
Auxiliary Burners – emissionns for use of fuel (tCO_2e)[g]	*4,815*
EfW Total emissions (tCO_2e/yr)	**273,326**
EfW Total emissions ($ktCO_2e$/yr)	**273.33**

[a] Derived from values for total annual waste input, total carbon % and non-biogenic carbon % in **Table 14.24**
[b] Nitrous oxide – emissions factor: 4 kgN_2O/TJ[63]
[c] Nitrous oxide – global warming potential: 265 $kgCO_2e/kgN_2O$[64]
[d] Methane – emissions factor: 30 $kgCH_4/TJ$[63]
[e] Methane – global warming potential: 28 $kgCO_2e/kgCH_4$[64]
[f] Auxiliary Burners: reported by the Applicant to be 90% of total expected annual gas oil use for the facility at 1,939,360 litres/yr
[g] Auxiliary Burners: fuel emissions factor for gas oil: 2.75857 $kgCO_2e$/litre[71]

Operational water

14.9.24 The Proposed Development is expected to use 40,000tpa of water, equating to lifetime operational water use GHG emissions of 0.24kt CO_2e calculated using the BEIS 2021 emissions conversion factor[71] for water supply.

Other operational processes

14.9.25 Emissions associated with operational transport are based on traffic data presented in **Chapter 6: Traffic and Transport (Volume 6.2)**. The following assumptions have been used.

14.9.26 The origin of the residual waste has been estimated from the WPA forecasted future residual waste requirements in the **Waste Fuel Availability Assessment (Volume 7.3)**, identifying those WPAs with a predicted shortfall in future residual waste management capacity. Information on the largest settlement in each WPA with a shortfall in capacity was obtained from the ONS 2011 Census[68] and from the City Population website[69]. Distance travelled was obtained from road distance on the fastest route according to Google Maps. The proportion of residual waste by origin and distance to the town centres of the largest settlement in each WPA is detailed below.

Table 14.28 Distance to the town centres of the largest settlement in each WPA

Origin WPA	Largest settlement	% share of overall shortfall in 2025	Distance to Proposed Development (km)
Central Bedfordshire, Bedford City Council and Luton Borough Council	Luton	11	125.7
Essex (including Southend on Sea)	Basildon	10	160.5

Origin WPA	Largest settlement	% share of overall shortfall in 2025	Distance to Proposed Development (km)
Hertfordshire	Watford	24	160.0
Norfolk	Norwich	33	91.9
Thurrock	Thurrock	3	164
Leicester City	Leicester	Unquantified	99.3
Leicestershire	Loughborough	1	113.0
Lincolnshire	Lincoln	5	94.5
Northamptonshire	Northampton	12	102.4
Rutland	Oakham	1	71.5

14.9.27 The average one-way commuting distance of 14.6km travelled by staff was obtained from DfT dataset on the Average number of trips, miles and time spent travelling by trip purpose in England[67].

14.9.28 'With Proposed Development' vehicle emissions are provided in **Table 14.29 With Proposed Development operational vehicle emissions**. Over the duration of the Proposed Development operational lifetime emissions from this source are anticipated to be approximately 271.68ktCO$_2$e.

Table 14.29 With Proposed Development operational vehicle emissions

Source	Annual Vehicle Movements	Annual distance travelled (km)	Average annual vehicles emissions (ktCO2e/yr)
HGV	80,496	9,849,728	6.70
LGV	4,992	610,836	0.08
Car	18,616	271,421	0.02
TOTAL Transport in operation			6.80

14.9.29 IBA and APCr will be transported offsite. It is estimated that lifetime emissions associated with the transportation of 165,600tpa of IBA to a suitable recycling facility and 31,280tpa of APCr for disposal equate to 142.60ktCO$_2$e. For IBA this is based

upon BEIS 2021 emissions conversion factor[71] for the recycling[93] of commercial and industrial waste. For APCr, emissions are based upon BEIS 2021 emissions conversion factor[71] for the landfill of aggregates[94].

Maintenance, repair, replacement, and refurbishment

14.9.30 The Proposed Development is expected to use 1,939,360 litres per annum of diesel, or Hydrotreated Vegetable Oil (HVO), of which 10% would be for maintenance, repair, replacement and refurbishment activities. This fuel use equates to 4.91ktCO_2e emissions over the lifetime of the EfW facility calculated using the BEIS 2021 emissions conversion factor[71] for gas oil. Use of HVO biofuel would reduce well to wheel GHG emissions from fuel use relative to diesel.

Summary

14.9.31 The total GHG emissions associated with the operational phase of the Proposed Development are estimated to be around 11,352.47ktCO_2e.

Decommissioning

14.9.32 There is no decommissioning required in the 'without Proposed Development' case and therefore emissions associated with the decommissioning phase can be assumed to be zero.

14.9.33 As described in **Chapter 3: Description of the Proposed Development (Volume 6.2)**, it is assumed that the environmental effects associated with the decommissioning phase would be of a similar level to those reported for the construction phase, albeit with a lesser duration of two years.

14.9.34 Therefore, the GHG emissions assumed to result from decommissioning of the Proposed Development are estimated at 48.38ktCO_2e.

Avoided emissions

14.9.35 The avoided emissions in the 'without Proposed Development' case relate to the generation of electricity from LFG as detailed in **Table 14.25 Landfill with electricity generation using LFG: annual GHG emissions**. This is 20.04ktCO_2e/yr. The rest of this sub-section refers to the 'with Proposed Development' case.

14.9.36 For the Proposed Development case the offset of GHG emissions from the generation of electricity by the EfW CHP Facility, relative to production of electricity from the UK grid mix, represent avoided emissions. Further sensitivity testing for emissions avoided from the potential export of steam from the EfW CHP facility is included in **Appendix 14C – Sensitivity analysis (Volume 6.4)**; however, for the main GHG assessment a worst-case scenario is assessed and therefore this benefit has not been accounted for here.

14.9.37 For the purposes of the assessment in the ES, to provide a conservative estimate of avoided emissions it has been assumed that rather than displacing electricity

[93] No closed-loop recycling factor is provided by BEIS for commercial and industrial waste, so the open-loop factor has been used.
[94] The APCr are not dissimilar to powdered cement.

generated by fossil fuels, the electricity generated by the Proposed Development will displace UK grid average electricity generation. Energy statistics produced by BEIS and published in DUKES 2021[76] have been used to calculate GHG emissions associated with the avoided emissions. Based on data for 2020-21, the estimated CO_2 emission per unit of electricity generated for all fuel types in the UK grid electricity is 182tCO_2/GWh on average. For the purposes of this assessment, coal-fired power generation is assumed to have retired by the first year of the Proposed Development operating.

14.9.38 The net electricity output of the Proposed Development (excluding the parasitic load) is 55MWe. If this power output was delivered instead by the average UK grid electricity generation, the estimated CO_2 emissions would be approximately 80.08ktCO_2e/yr from the year of opening.

14.9.39 The lifetime avoided emissions for the Proposed Development, over the 40-year operational lifetime is estimated to be 3,203.20ktCO_2e (see **Table 14.30 EfW CHP Facility: annual operational GHG emissions**).

Table 14.30 EfW CHP Facility: annual operational GHG emissions.

Parameter	Value
Electricity generated by EfW CHP Facility (MWh)	440,000
EfW equivalent CO_2 offset for electricity generation by Facility (ktCO_2e/yr)	80.08
Total avoided emissions over operational lifetime (ktCO_2e)	3,203.20

It is assumed the operational period is 8000 hours/year, allowing for downtime, and thus 440,000 MWh/yr of power is anticipated to be produced by the Proposed Development.

Summary

14.9.40 The GHG assessment described above has considered the GHG emissions from each assessed GHG source during the construction, operation and decommissioning phases of the Proposed Development. **Table 14.31 GHG emission estimates during the lifecycle of the Proposed Development case and without Proposed Development case** provides a summary of the sources with a breakdown and comparison of GHG emissions in the 'with Proposed Development' and 'without Proposed Development' case.

Table 14.31 GHG emission estimates during the lifecycle of the Proposed Development case and without Proposed Development case

Stage of the Proposed Development	Main stage of Proposed Development life cycle	Estimate emissions 'without Proposed Development' case ($ktCO_2e$)	Estimate emissions 'with Proposed Development' case ($ktCO_2e$)
Construction	A1 – A2 – A3 – Raw materials supply, transport and manufacture	-	35.55
	A5 – Construction process stage	-	4.90
	A4 – Construction Transport	-	7.93
Operation	B2 – B5 – Maintenance, repair, replacement and refurbishment [a]	-	4.91
	B6 – Operational energy	25.04	10,933.05
	B7 – Operational water	-	0.24
	B8 – Other operational processes: Landfill	11,489.35	-
	B8 – Other operational processes: Operational transport	103.85	271.68
	B8 – Other operational processes: IBA and APCr	-	142.60
Decommissioning	C1 – C2 – C3 – C4 – End of life, including deconstruction, transport, waste processing for recovery and disposal *	-	48.38
General	D – Avoided emissions	-801.42	-3,203.20
TOTAL		10,816.83	8,246.03
Net change in GHG emissions resulting from the Proposed Development ($ktCO_2e$)		-	-2,570.80

* Assumed to be equivalent to construction.

14.9.41 As outlined in **Table 14.31 GHG emission estimates during the lifecycle of the Proposed Development case and without Proposed Development case** above, the total GHG emissions over the life cycle of the Proposed Development (three-year construction phase, 40-year operational phase and one year of decommissioning) is estimated at approximately 8,246$ktCO_2e$.

14.9.42 Relative to the 'without Proposed Development' case, the Proposed Development is estimated to result in a net decrease in GHG emissions equivalent to approximately 2,571ktCO_2e over its lifetime.

14.9.43 The assessment shows that GHG emissions will be lower in the 'with Proposed Development' case compared to the 'without Proposed Development' case.

Contextualisation against relevant UK carbon budgets

14.9.44 To determine the significance of the Proposed Development's contribution to the UK GHG emissions, the assessment compared two cases: the 'with Proposed Development' case and the 'without Proposed Development' case. The net change as a result of the Proposed Development (as shown in **Table 14.31 GHG emission estimates during the lifecycle of the Proposed Development case and without Proposed Development case**) is contextualised against the carbon budgets as set out in **Table 14.16 UK carbon budgets**.

14.9.45 In line with IEMA guidance[36], **Table 14.32 Estimates GHG emissions contextualised against the relevant UK carbon budgets** provides an assessment of the Proposed Development's GHG emissions impact against the UK Government's five-year carbon budgets.

14.9.46 The GHG assessment has considered GHG emissions from the Proposed Development in three separate phases: construction, operation and decommissioning. The construction of the Proposed Development will be a short-term activity that runs from approximately 2023 to 2026. GHG emissions from the construction phase will therefore fall within the fourth (2023 to 2027) carbon budget. GHG emissions from the operation phase of the Proposed Development will fall into the fourth, fifth (2028 to 2032) and sixth (2033 to 2037) carbon budgets and subsequent future budgets once set through from 2038 and beyond. GHG emissions from the decommissioning of the Proposed Development will fall entirely within future budgets once set. The assessment also considers the impact of the Proposed Development on the achievement of the 2050 net zero target to which future carbon budgets will be aligned.

14.9.47 **Table 14.32 Estimates GHG emissions contextualised against the relevant UK carbon budgets** presents the net ktCO_2e associated with the construction and operation phases of the Proposed Development during each of the legislated carbon budget periods.

Table 14.32 Estimates GHG emissions contextualised against the relevant UK carbon budgets

Proposed Development phase	Estimated total GHG emissions from the Proposed Development (ktCO2e)	Net GHG emissions change (ktCO2e)	Net Proposed Development GHG emissions per relevant carbon budget (ktCO2e) and 2050 net zero target (ktCO2e/yr)			
			4th (2023 to 2027)	5th (2028 to 2032)	6th (2033 to 2037)	2050 net zero target (2050 only)
			1,950,000	1,725,000	965,000	Net zero
Construction	48.38	48.38	48.38	-	-	-
Operation (including avoided emissions)	8,149.27	-2,667.56	-131.79	-330.55	-332.47	-66.92
Decommissi-oning	48.38	48.38	-	-	-	-
Total	8,246.03	-2,570.80	-83.41	-330.55	-332.47	-66.92

14.9.48 This assessment has established that the Proposed Development net GHG emissions reduction will equate to 0.004% of the UK's carbon budget for the fourth carbon budget, 0.02% of the UK's fifth carbon budget and 0.03% of the sixth carbon budget. In 2050 when the UK net carbon budget is zero (and the Climate Change Committee state that waste sector emissions can be reduced by 75% from today's levels[44]), the Proposed Development will have a beneficial impact equivalent to -67ktCO$_2$e.

14.9.49 In accordance with IEMA guidance[36] for defining significance (see **Table 14.19 Significance criteria for the GHG assessment**) it is concluded that the GHG impact of the Proposed Development will have a **beneficial Significant effect**. The Proposed Development has net GHG emissions below zero, causing an indirect reduction in atmospheric GHG emissions which has a positive impact on the UK Government meeting its carbon budgets/targets.

14.9.50 With respect to GHG emissions at a local level, the Proposed Development will receive residual waste from local authorities and businesses in the region that would otherwise be deposited in landfill. Given the net benefits of GHG emissions of the EfW CHP Facility over the alternative landfill disposal, it is considered that the Proposed Development will have a positive contribution in supporting carbon reduction targets and ambitions for carbon neutrality and net zero in areas where landfill would otherwise be used for residual waste. This does not account for the additional benefit that would be achieved through the CHP connection to local businesses. This is considered in the sensitivity testing in **Appendix 14C – Sensitivity Analysis (Volume 6.4)** but has not been accounted for in the main GHG assessment.

14.9.51 At a local level, CCC has a vision to deliver net zero emissions for Cambridgeshire by 2050[28] while Norfolk County Council are aiming to work towards carbon neutrality by 2030 in the wider area[32]. The assessment above demonstrates that over these timescales the Proposed Development can have a beneficial local effect in terms of achieving these carbon reduction targets, but this will depend on whether landfill would otherwise be used for residual waste management in these regions. The GHG emissions for the 'without Proposed Development' case have been calculated assuming waste is collected and transported to available landfill sites.

Cumulative effects

14.9.52 The GHG assessment examines the extent to which the Proposed Development materially affects the ability of the UK Government to meet its carbon target and budgets by 2050. The impact of the Proposed Development on UK national projected GHG emissions is evaluated. The assessment can be regarded as a cumulative assessment as the national projected GHG emissions take into account trends such as future development, technology and population changes which will have a bearing on national projections.

14.9.53 The approach to cumulative effects assessment for GHGs differs from that to other environmental topic chapters of the ES where consideration of cumulative effects will be considered and reported within **Chapter 18: Cumulative Effects Assessment (Volume 6.2)**. All global cumulative GHG sources are relevant to the effect on climate change, and this is taken into account in defining the Receptor as being of 'high' sensitivity'. Effects of GHG emissions from specific cumulative projects are not assessed, as there is no basis for selecting any particular (or more than one) cumulative project that has GHG emissions for assessment over any other. As the scope for cumulative effects has the potential to be unlimited, it is not viable to assess cumulative effects resulting from the operation of the Proposed Development. This approach is in accordance with IEMA guidance[36].

Climate change resilience

14.9.54 The CCR assessment considers the embedded environmental measures described in **Section 14.7** and **14.11** to ensure resilience to climate change.

14.9.55 The assessment of the effects of climate change on the Proposed Development is described for the construction, operational and decommissioning phases of the Proposed Development, where the outputs are provided in **Table 14.33 CCR assessment for the construction phase of the Proposed Development**, **Table 14.34 CCR assessment for the operational phase of the Proposed Development** and **Table 14.35 CCR assessment for the decommissioning phase of the Proposed Development**, respectively. The maintenance activities are included within the operational phase.

Table 14.33 CCR assessment for the construction phase of the Proposed Development

			Risk without embedded mitigation				Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Residual Risk/Significance**
Increased daily mean temperatures and frequency and intensity of heat waves	Building and infra-structure	Restriction of certain construction activities during hot weather, for example, the pouring of concrete in higher temperatures could reduce the strength and durability of the finished product, and the laying of asphalt could become difficult as it fails to maintain profile during compaction. This could cause programme delay and increased costs.	Unlikely	Low	Negligible (**Not Significant**)	Materials would be selected in accordance with relevant standards and design mixes would be altered to suit projected weather conditions. The construction programme would be flexible in order to schedule activities to take into account the weather conditions.	Very unlikely	Very low	Negligible (**Not Significant**)

			Risk without embedded mitigation				Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Residual Risk/Significance**
	Human health	Increased risk of unsafe working environments in hot weather and the potential health impacts on construction staff.	Unlikely	Medium	Minor (**Not Significant**)	The Contractor(s) would pay due consideration to the impacts of potential extreme hot weather events and related conditions during construction following construction health and safety procedures and risk assessments, produced by the Contractor prior to commencement on site. The Contractors would use a short to medium range weather forecasting service for programme management, environmental control and impact mitigation measures.	Very unlikely	Medium	Negligible (**Not Significant**)
Increased temperature and decrease in	Human health	Hotter and drier weather could lead to an increase in	Unlikely	Low	Negligible (**Not Significant**)	The Contractor(s) would detail dust mitigation measures as	Very unlikely	Low	Negligible (**Not Significant**)

			Risk without embedded mitigation				Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Residual Risk/Significance**
rainfall in summer		dust creation from construction activities, leading to impacts on the health of construction workers and the failure of machinery and equipment.				specified within the Outline CEMP to manage dust generated on the construction site and any dusty processes.			
Increase in mean winter rainfall	Building and infrastructure	Overwhelming of the construction site drainage system causing flooding across the site.	Possible	Large	Major (**Significant**)	Surface runoff and any pumped groundwater from excavations would be attenuated in sustainable drainage system (SuDS) (detention basins and underground tank) on site and discharged at greenfield runoff rate into the adjacent drains. The SuDS would be inspected and maintained regularly to ensure they continue to operate to their design standard, safeguarding surface	Unlikely	Medium	Minor (**Not Significant**)

			Risk without embedded mitigation				Risk and significance		
Climate trend	Receptor	Potential climate change impact	Likelihood of Impact	Consequence of Impact	Risk	Embedded mitigation measures	Likelihood of Impact	Consequence of Impact	Residual Risk/Significance
						and groundwater quality. To account for the effects of climate change, drainage systems have been designed to accommodate a 1 in 100yr rainfall event with 20% uplift of rainfall intensity, which is conservative for a 3-year construction period (further details on construction drainage provided in Appendix 12F: Outline Drainage Strategy (Volume 6.4)). The construction programme would be flexible to account for any down time following flood events.			

Climate trend	Receptor	Potential climate change impact	Risk without embedded mitigation: Likelihood of Impact	Risk without embedded mitigation: Consequence of Impact	Risk without embedded mitigation: Risk	Embedded mitigation measures	Risk and significance: Likelihood of Impact	Risk and significance: Consequence of Impact	Risk and significance: Residual Risk/Significance
	Environment	Erosion of stockpiled site-won materials and cut earthworks, leading to potential silt off and environmental pollution.	Possible	Medium	Moderate (**Probably Significant**)	Chapter 13: Geology Hydrology and Contaminated Land (Volume 6.2) and Outline CEMP specifies the protection of stockpiles from erosion through impermeable sheeting and covering with adequate leachate/runoff drainage. Chapter 12: Hydrology (Volume 6.2) specifies that stockpiles which remain present for three months or longer will be carefully managed by establishment of a grass cover. The Outline CEMP details pollution prevention measures to be employed, for example,	Very unlikely	Medium	Negligible (**Not Significant**)

			Risk without embedded mitigation				Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Residual Risk/Significance**
						SuDS features (swales and detention basins) would be used to reduce sediment in the water discharge.			
	Human health	Increased safety risk of slips, trips and falls to construction workforce.	Possible	Low	Minor (**Not Significant**)	The Contractor(s) would pay due consideration to the impacts of potential extreme weather events and related conditions during construction, which would include flooding as set out in the Outline CEMP. The Contractors would use a short to medium range weather forecasting service for programme management, environmental control and impact mitigation measures.	Very unlikely	Low	Negligible (**Not Significant**)

			Risk without embedded mitigation				Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Residual Risk/Significance**
	Building and infrastructure	Flooding of construction site access roads causing delays to the construction programme.	Possible	Large	Major (**Significant**)	The Contractor(s) would pay due consideration to the impacts of potential extreme wet weather events and related conditions during construction following construction health and safety procedures and risk assessments, produced by the Contractor prior to commencement on site. The Contractors would use a short to medium range weather forecasting service to manage potential flooding events preventing access which are reflected in the Outline CEMP flood management measures. There are two access points for construction traffic	Possible	Low	Minor (**Not Significant**)

			Risk without embedded mitigation				Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Residual Risk/Significance**
						which could reduce the impact, but it is accepted there may be minimal delay to construction.			
	Building and infra-structure	Water ingress to critical equipment, including power distribution, leading to electronic equipment failures, requiring switch off or, possibly causing damage.	Possible	Medium	Moderate (**Probably Significant**)	To account for the effects of climate change, the site drainage system has been designed to accommodate a 1 in 100yr rainfall event with 20% uplift of rainfall intensity, which is conservative for a 3-year construction period (further details provided in (Appendix 12F: Outline Drainage Strategy (Volume 6.4)). The Contractors would use a short to medium range weather forecasting service to manage potential flooding events with	Very unlikely	Low	Negligible (**Not Significant**)

			Risk without embedded mitigation				Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Residual Risk/Significance**
						further information provided in the Outline CEMP. Construction equipment used is mobile and would be moved to avoid flood damage in response to any flood alerts. The critical operational equipment will be brought to site and placed into the permanent position on the constructed plinth above the flood level, avoiding any risk of damage in a flood event.			
Increased intensity and frequency of storm events	Building and infrastructure	There is an increased risk of disruption to construction work, such as cranes unable to operate in high winds.	Unlikely	Medium	Minor (**Not Significant**)	The Contractor(s) would pay due consideration to the impacts of potential extreme storm weather events and related conditions during construction following	Very unlikely	Very low	Negligible (**Not Significant**)

			Risk without embedded mitigation				Risk and significance		
Climate trend	Receptor	Potential climate change impact	Likelihood of Impact	Consequence of Impact	Risk	Embedded mitigation measures	Likelihood of Impact	Consequence of Impact	Residual Risk/Significance
						construction health and safety procedures and risk assessments, produced by the Contractor prior to commencement on site, this would include for construction activities in high winds, including the restricted use of cranes to prevent harm or damage. The construction programme would be flexible to allow for weather related delays such as high winds.			

Table 14.34 CCR assessment for the operational phase of the Proposed Development

			Risk without embedded mitigation				Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Significance**
Increased daily mean temperature and frequency and intensity of heat waves	Buildings and infrastructure	Thermal loading on structures which could lead to failure in, for example, joints and bearings.	Unlikely	Medium	Minor (**Not Significant**)	Structures would be designed in accordance with relevant standards and will capture future temperature ranges in their design.	Very unlikely	Medium	Negligible (**Not Significant**)
	Buildings and infrastructure	Increased rate of degradation of access road surface material, such as asphalt.	Likely	Low	Moderate (**Probably Significant**)	The surfacing of access roads would be concrete which is less sensitive to temperatures and accelerated degradation. Any additional maintenance requirements will be addressed and changes to concrete mixes to accommodate higher temperatures over the lifetime of the asset would be implemented.	Unlikely	Low	Negligible (**Not Significant**)

			Risk without embedded mitigation				Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Significance**
	Buildings and infrastructure	Overheating of mechanical and electrical (M&E) equipment leading to failure.	Possible	Medium	Moderate (**Probably Significant**)	The specification of M&E equipment would account for future temperature ranges and would incorporate a means of internal cooling, where necessary. The EfW CHP Facility would also benefit from a mechanical cooling system where viable to ensure temperatures are controlled within the building whilst the exterior of the administration building will include solar shading (brise soleil).	Unlikely	Medium	Minor (**Not Significant**)
	Human health	Increased heat stress/heat exhaustion for workforce.	Likely	Large	Major (**Significant**)	Health and Safety standards and procedures would be followed at all times on site including consideration for extreme weather events and their impact	Very unlikely	Medium	Negligible (**Not Significant**)

			Risk without embedded mitigation				Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Significance**
						on hazardous working conditions, where required, e.g., rest periods when working outside and work inside the building where temperature can be controlled.			
	Buildings and infrastructure	Risk of cascading failures due to high temperatures, for example overheating of electrical substations leading to loss of power to the site.	Possible	High	Major (**Significant**)	In the event of loss of electrical grid connection to the EfW CHP Facility due to third party dependencies, the EfW CHP Facility can continue to operate by using the plant to self-generate the power required for continued operations, this is known as island mode. An emergency diesel generator is also available in case of emergencies, to be used for the safe shut	Possible	Low	Minor (**Not Significant**)

			Risk without embedded mitigation				Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Significance**
						down of the EfW CHP Facility.			
Increased summer temperature coupled with decreased summer rainfall	Buildings and infrastructure	Changes to soil moisture levels causing shrink swell within the soils, leading to deterioration of structure foundations.	Possible	Medium	Moderate (**Probably Significant**)	Climate change effects on groundwater resources have been considered in the design of the Proposed Development. The construction of the EfW CHP Facility would include piled foundations which are less susceptible to shrink-swell effects. The design of the roads has also accounted for soil moisture levels and the climate change allowances applied within the FRA.	Very unlikely	Medium	Negligible (**Not Significant**)
	Environmental	Failure of landscaping and	Possible	Low	Minor (**Not Significant**)	Species rich meadow mixes have been selected as the	Unlikely	Low	Negligible (**Not Significant**)

			Risk without embedded mitigation				Risk and significance		
Climate trend	Receptor	Potential climate change impact	Likelihood of Impact	Consequence of Impact	Risk	Embedded mitigation measures	Likelihood of Impact	Consequence of Impact	Significance
		biodiversity planting.				predominant land cover to maximise biodiversity value. A neutral grassland has been specified across the majority of the site and a wetland mix is specified within or adjacent to SUDs features. The wildflowers and grasses within both meadow mixes are dominated by generalist species and will be sown sparsely to allow for the natural colonisation of species from the local area over the establishment period of the sward. Shrubs and trees planted on the site will be native species resilient to climate change that reflect the ground conditions that vary from a periodically			

			Risk without embedded mitigation				Risk and significance		
Climate trend	Receptor	Potential climate change impact	Likelihood of Impact	Consequence of Impact	Risk	Embedded mitigation measures	Likelihood of Impact	Consequence of Impact	Significance
						wet basin that will be planted with a wet woodland mix to drier conditions along the edge of the access roads where drought tolerant trees with tighter canopies and include cultivars of native Field Maple and Rowan. The maintenance strategy in the first five years includes the monitoring and control of notifiable weeds and other invasive species and watering in drought periods. These measures are designed to aid the successful establishment of planting that should then require minimal long-term maintenance.			

			Risk without embedded mitigation				Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Significance**
Decrease in summer rainfall	Buildings and infrastructure	Risk of cascading failures due to drought affecting potable water supply required for plant operations.	Likely	Large	Major (**Significant**)	In typical operating conditions the water demand of the EfW CHP Facility is low and there is limited demand for reuse of surface water runoff in the process. In addition, source control measures have been considered in the design of the EfW CHP Facility. These include permeable paving with total infiltration in the laydown maintenance area and rainwater harvesting including grey water and brown roof for the administration building and brown roof for the Weighbridge.	Unlikely	Medium	Minor (**Not Significant**)

			Risk without embedded mitigation				Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Significance**
Increased mean winter rainfall and sea level rise.	Human health	Increased safety risk of slips, trips and falls to construction workforce.	Likely	Medium	Major (**Significant**)	Construction health and safety protocols and procedures would be followed at all times at the facility including consideration for extreme weather events and their impact on hazardous working conditions.	Very unlikely	Low	Negligible (**Not Significant**)
	Buildings and infrastructure	Increased surface water runoff exceeding the capacity of the drainage system, causing flooding across the site.	Possible	Large	Major (**Significant**)	Attenuation storage is to be provided in the form of underground tanks to collect surface runoff prior to discharge at greenfield runoff into adjacent drains. To account for the effects of climate change, drainage systems have been designed to accommodate a 40% uplift of rainfall intensity which is appropriate	Very unlikely	Medium	Negligible (**Not Significant**)

			Risk without embedded mitigation				Risk and significance		
Climate trend	Receptor	Potential climate change impact	Likelihood of Impact	Consequence of Impact	Risk	Embedded mitigation measures	Likelihood of Impact	Consequence of Impact	Significance
						considering the design life of the Proposed Development (40 years). In addition, source control measures have been considered in the design of the EfW CHP Facility to reduce surface runoff. These include permeable paving with total infiltration in the laydown maintenance area and rainwater harvesting and brown roof for the Weighbridge			

			Risk without embedded mitigation				Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Significance**
	Buildings and infrastructure	Flooding of access routes to the site leading to disruption in vehicle traffic and facility operations.	Possible	Large	Major (**Significant**)	Access roads are designed to be set above the 0.1% Annual Exceedance Probability (AEP) flood level to ensure continued accessibility to the site. In the event of a breach of the flood defence along the River Nene above the one in 1000-year event plus climate change in 2115, the Proposed Development could continue operations for approximately 11 days due to the waste bunker capacity. There is also storage capacity for other essential consumables to allow continued operation.	Unlikely	Low	Negligible (**Not Significant**)

			Risk without embedded mitigation				Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Significance**
	Buildings and infrastructure	Groundwater flooding of the waste bunker or groundwater uplift, causing damage to the building and requirement for controlled discharge of dewatering to avoid environmental pollution.	Possible	Large	Major (**Significant**)	The design of the EfW CHP Facility and the waste bunker will take into account engineering measures to appropriately seal the bunker from groundwater flooding and design against groundwater uplift effects. These measures will be confirmed at detailed design stage.	Unlikely	Low	Negligible (**Not Significant**)
	Buildings and infrastructure	Water ingress to critical equipment, including power distribution, leading to electronic equipment failures, requiring switch off or, possibly causing damage.	Possible	Large	Major (**Significant**)	Critical infrastructure, such as the power generating elements, Weighbridge and access roads, are designed so that the Finished Floor Level (FFL) is above the 0.1% AEP tidal flood level plus climate change allowance.	Very unlikely	Medium	Negligible (**Not Significant**)

			Risk without embedded mitigation				Risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Significance**
						This equates to a FFL of 3m AOD for the critical infrastructure, which is set above any residual flood risk from overtopping of the defences.			
Increased frequency and intensity of storm events	Buildings and infrastructure	Increasing loads on structures and overhead lines leading to collapse.	Unlikely	Large	Moderate (**Probably Significant**)	Structures would be designed in accordance with relevant standards to account for wind loading. The Grid Connection infrastructure installed as part of the Proposed Development is underground, reducing the assets vulnerability to storm and wind impacts.	Very unlikely	Low	Negligible (**Not Significant**)

Table 14.35 CCR assessment for the decommissioning phase of the Proposed Development

			Risk without embedded mitigation				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Significance**
Increased daily mean temperatures and frequency and intensity of heat waves	Buildings and infrastructure	Restriction of certain reinstatement or decommissioning activities during hot weather, for example, the pouring of concrete in higher temperatures could reduce the strength and durability of the finished product, and the laying of asphalt could become difficult as it fails to maintain profile during compaction. This could cause programme delay.	Likely	Low	Moderate (**Probably Significant**)	Reinstatement materials would be selected in accordance with relevant future design standards and design mixes would be altered to suit current weather conditions. The decommissioning works programme would be flexible in order to schedule activities to take into account the weather conditions.	Unlikely	Low	Negligible (**Not Significant**)
	Human health	Increased risk of unsafe working environments in hot weather and the potential health impacts on construction staff	Likely	Large	Major (**Significant**)	The Contractor(s) would pay due consideration to the impacts of potential extreme hot weather events and related conditions during	Unlikely	Medium	Minor (**Not Significant**)

			Risk without embedded mitigation				Residual risk and significance		
Climate trend	Receptor	Potential climate change impact	Likelihood of Impact	Consequence of Impact	Risk	Embedded mitigation measures	Likelihood of Impact	Consequence of Impact	Significance
						decommissioning, following health and safety procedures and risk assessments, produced by the Contractor prior to commencement of decommissioning. This would include measures such as shortened shift rotations and reduction in the length of outside working. The Contractors would use a short to medium range weather forecasting service for programme management, environmental control and impact mitigation measures.			

			Risk without embedded mitigation				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Significance**
Increased temperatures and decrease in rainfall in summer	Human health	Hotter and drier weather could lead to an increase in dust creation from decommissioning and demolition activities, leading to impacts on the health of construction workers and the failure of machinery and equipment.	Likely	Low	Moderate (**Probably Significant**)	The Contractor(s) would detail dust mitigation measures within a Decommissioning Environmental Management Plan (DEMP) and construction health and safety protocols and procedures to manage dust generated on the construction site and any dusty processes. Where possible, dust management would utilise greywater to reduce the impact on potable water supplies during drought conditions.	Unlikely	Low	Negligible (**Not Significant**)
Increase in mean winter rainfall	Buildings and infrastructure	Overwhelming of the site drainage system causing flooding across the site during decommissioning	Unlikely	Medium	Minor (Not Significant)	Surface runoff will be attenuated in SuDS on site and discharged at greenfield runoff rate into the adjacent	Unlikely	Low	Negligible (**Not Significant**)

			Risk without embedded mitigation				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Significance**
						drains. Management of runoff during the decommissioning phase will be detailed in the DEMP.			
	Environment	Risk to material stockpiles during decommissioning, resulting in environmental damage from silt runoff.	Possible	Medium	Moderate (**Probably Significant**)	Chapter 13: Geology Hydrology and Contaminated Land (Volume 6.2) specifies the protection of stockpiles from erosion through impermeable sheeting and covering with adequate leachate/runoff drainage. Chapter 12: Hydrology (Volume 6.2) specifies that stockpiles which remain present for three months or longer will be carefully managed by establishment of a grass cover. The DEMP and its method statements would	Unlikely	Medium	Minor (**Not Significant**)

			Risk without embedded mitigation				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Significance**
						detail pollution prevention measures to be employed, SuDS features will be used to reduce sediment in the runoff discharge.			
	Human health	Increased safety risk of slips, trips and falls to construction workforce.	Possible	Low	Minor (**Not Significant**)	The Contractor(s) would pay due consideration to the impacts of potential extreme weather events and related conditions during decommissioning following recognised health and safety procedures and risk assessments, produced by the Contractor prior to commencement on site The Contractors would use a short to medium range weather forecasting service to programme	Very unlikely	Low	Negligible (**Not Significant**)

			Risk without embedded mitigation				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Significance**
						management, environmental control and impact mitigation measures.			
	Buildings and infrastructure	Flooding of site access roads causing delays to the decommissioning programme	Unlikely	Medium	Minor (**Not Significant**)	The Contractor(s) would pay due consideration to the impacts of potential extreme weather events and related conditions during decommissioning, which would include detailing relevant measures within the DEMP. The Contractors would use a short to medium range weather forecasting service to manage potential flooding events preventing access which would be reflected in the DEMP	Unlikely	Medium	Minor (**Not Significant**)

			Risk without embedded mitigation				Residual risk and significance		
Climate trend	**Receptor**	**Potential climate change impact**	**Likelihood of Impact**	**Consequence of Impact**	**Risk**	**Embedded mitigation measures**	**Likelihood of Impact**	**Consequence of Impact**	**Significance**
						flood management measures. It is accepted there may be minimal delay to decommissioning activities.			
Increased intensity and frequency of storm events	Building and infrastructure	There is an increased risk of disruption to construction work, such as cranes unable to operate in high winds.	Possible	Medium	Moderate (**Probably Significant**)	The Contractors would use a short to medium range weather forecasting service and detail any management measures within the procedures for decommissioning activities in high winds, including the restricted use of cranes to prevent harm or damage. The decommissioning programme would be flexible to allow for weather related delays such as high winds.	Possible	Low	Minor (**Not Significant**)

Risks from interdependencies

14.9.56 The Proposed Development's CCR is also subject to several 'cascading' risks from its interdependencies such as electricity, gas, transport and telecommunications networks, and infrastructure which manages waste arisings from the EfW CHP Facility (including IBA and APCr).

14.9.57 The relevant UK infrastructure operators (for example, National Highways, National Grid, UK Power Networks, Anglian Water, the Environment Agency etc.) supply Climate Change Adaptation Reports[95,96] under the Climate Change Act 2008[1] and are subject to climate change adaptation requirements set by respective regulators. This mechanism for CCR has been factored into the assessment when considering the likelihood and consequence scales of the climate change impacts associated with this infrastructure.

'Without Proposed Development' case

14.9.58 In the 'without Proposed Development' case it is assumed that waste is disposed of at existing landfill sites. It is beyond the scope of this assessment to conduct a full analysis of the climate resilience of landfills; however, high-level impacts are listed below to allow for a comparison with the 'with Proposed Development' case.

14.9.59 Landfill sites have a long lifetime and can take up to 100 years to stabilise, therefore could experience the climate change impacts across their lifetime, including current landfills which may not have been designed for the degree of change predicted. Recent research has highlighted historic landfills, many of which are unlined, are vulnerable to heavy rains and flooding[97], and even those with engineered liners will retain the ability to pollute the environment for a significant amount of time unless steps are taken to change the management process[4]. It is therefore deemed possible that more intense rainfall as a result of climate change may lead to increased leaching of harmful chemicals into the environment, without further intervention. This is bolstered by the Environment Agency's Adaptation Report[98] which listed an increase in pollution incidents from landfill as a result of heavy rainfall as a challenge to continued environmental protection.

14.9.60 The 2021 Independent Assessment of UK Climate Risk[4] report concludes that *"of all solid waste management infrastructure, landfill sites are the most vulnerable to long term climate change"*[4]. Therefore, climate change impacts on landfills are more likely to occur and have more severe consequences than other waste facilities, such as significant environmental pollution.

14.9.61 A review of climate resilience of waste sites was conducted and summarised within the UK CCRA2 2017 for Infrastructure[99]. Although the 2017 UK CCRA2 has been superseded, the tabulation of climate impacts on landfill sites are still highly relevant

[95] Defra (2017). Climate change adaptation reporting: second round reports.
[96] Defra (2018). Climate change adaptation reporting: third round.
[97] ENDS Report (2021), Toxic time bombs: The historic landfills at risk of flooding.
[98] The Environment Agency (2016). Adapting to a changing climate. The Environment Agency's second adaptation report under the Climate Change Act..
[99] Dawson, R.J., Thompson, D., Johns, D., Gosling, S., Chapman, L., Darch, G., Watson, G., Powrie, W., Bell, S., Paulson, K., Hughes, P., and Wood, R. (2016) UK Climate Change Risk Assessment Evidence Report: Chapter 4, Infrastructure. Report prepared for the Adaptation Sub-Committee of the Committee on Climate Change, London.

and have been summarised, together with the 'Increasing the climate resilience of waste infrastructure' report commissioned by Defra[100]. A summary of the climate impacts are contained in **Table 14.36 High level assessment of climate change impacts on landfill sites**.

Table 14.36 High level assessment of climate change impacts on landfill sites

Climate impact	Climate effect on landfill sites
Increase in daily mean temperatures and intensity and frequency of heatwaves	Increased rates of decomposition and degradation (beneficial).
	Increased health risks e.g., disease transmission from putrescible waste.
	Increased fire risk from combustibles.
	Increased odour and dust.
	Increase in waste collection frequency to reduce problems with vermin.
	Disruption to transport network.
Increase in winter precipitation and/or increased peak winter rainfall	Overwhelming site drainage systems causing flooding and environmental pollution.
	Increased risk to gas and leachate collection and control in heavy rainfall events.
	Increased risk of erosion or instability of bunds and capping layers.
	Disruption to transport networks due to flooding affecting the collection and transportation of wastes.
	Disruption of energy supply leading to breaks in waste treatment.
Decrease in summer precipitation	Shortage of water for waste processes such as composting.
	Stress on restoration vegetation.
Sea level rise	Inundation and erosion at low lying coastal sites, leading to environmental pollution and disruption of waste treatment.

Cumulative effects

14.9.62 The ICCI assessment is an assessment of the exacerbation of climate change on existing effects of other environmental topics or the ability of mitigation to be implemented in the knowledge of future climate change trends. This is reported as part of the relevant aspect core assessments, as described in **Section 14.1**. A standalone ICCI Zone of Influence (ZoI) will therefore not be required.

Summary

14.9.63 The assessment of significance of CCR is presented in **Table 14.33** for the construction phase, **Table 14.34 CCR assessment for the operational phase of**

[100] Winne, S., Horrocks, L., Kent, N., Miller, K., Hoy, C., Benzie, M., & Power, R. (2012) Increasing the climate resilience of waste infrastructure. Final Report under Defra contract ERG 1102. AEA group, published by Defra.

the Proposed Development for the operational phase and **Table 14.35 CCR assessment for the decommissioning phase of the Proposed Development** for decommissioning. There are **No Significant effects** remaining following the assessment of climate change impacts on the construction, operational and decommissioning phases of the Proposed Development and its Receptors. This is because all relevant and implementable environmental measures have been employed into all phases of the Proposed Development.

14.10 Consideration of optional additional mitigation or compensation

GHG assessment

14.10.1 The GHG assessment set out above has concluded that the Proposed Development offers a **beneficial Significant effect** in terms of GHG emissions. However, further mitigation measures have the potential to reduce GHG emissions further and enhance the beneficial impact of the Proposed Development. These would be in addition to those assessed in this chapter.

14.10.2 For example, as described in **Chapter 3: Description of the Proposed Development (Volume 6.2)**, the Proposed Development has been conceived and designed to allow the export of steam and electricity from the EfW CHP Facility to surrounding business users via dedicated pipelines and private wire cables. Potential end users of the heat and power have been identified along the line of the disused March to Wisbech Railway. Subject to agreement, by using the steam generated, users will be able to reduce their carbon footprint associated with steam and heat generation. This is considered in the sensitivity testing in **Appendix 14C – Sensitivity analysis (Volume 6.4)** but has not been accounted for in the main GHG assessment, so agreement with users will increase the benefits stated.

14.10.3 The Proposed Development also includes land set aside for the possible future inclusion of CCS technology, subject to technical viability and developing government policy.

Climate change resilience

14.10.4 No additional mitigation measures are proposed to further reduce the vulnerability to climate change effects that are identified in this ES. This is because all relevant and implementable measures have been embedded into the development proposals and are assessed above in this chapter. These measures are considered to be likely to be effective and deliverable and address the likely significant effects of the Proposed Development.

14.11 Implementation of environmental measures

14.11.1 **Table 14.37 Summary of environmental measures to be implemented – relating to climate** describes the environmental measures embedded within the Proposed Development and the proposed means by which they will be implemented.

Table 14.37 Summary of environmental measures to be implemented – relating to climate

Environmental measure	Responsibility for implementation	Proposed Compliance mechanism	ES section reference
Commitment to seek continuous improvement in energy efficiency	Applicant	Environmental Permits as provided to the Environment Agency	**Section 14.9**
Design measures to avoid and prevent and reduce GHG emissions	Applicant	Review of detailed design including CHP Connection and a design that is carbon capture retrofit ready with land set aside for a CCS facility	**Section 14.9**
Connection to provide CHP	Applicant	Development description defined in **Chapter 3: Description of the Proposed Development (Volume 6.2**) and the **Draft DCO (Volume 3.1)**.	**Section 14.9**
Construction measures to reduce GHG emissions	Applicant/EPC Contractor	DCO Requirement for **Outline CEMP (Volume 7.12)**	**Section 14.9**
Design measures to reduce GHG emissions in relation to embodied carbon	Applicant	Review of detailed design	**Section 14.9**
Design of Proposed Development to be resilient to current weather impacts	Applicant/Contractor	Review of detailed design	**Section 14.9**
The construction programme to be flexible to integrate extreme weather-related delays and allow flexibility of timings of critical activities	EPC Contractor	DCO Requirement for **Outline CEMP (Volume 7.12)** and contractor health and safety procedures and risk assessments	**Section 14.9**
Contractor to sign up for short to medium range weather forecasting alerts	EPC Contractor	DCO Requirement for **Outline CEMP (Volume 7.12)**	**Section 14.9**
Installation of lightning protection system where required	Applicant	Development description defined in **Chapter 3: Description of the Proposed Development (Volume 6.2**) and the **Draft DCO (Volume 3.1)**.	**Section 14.9**
Design of Proposed Development to give consideration to climate change adaptation in line	Applicant	Review of detailed design and equipment specifications	**Section 14.9**

Environmental measure	Responsibility for implementation	Proposed Compliance mechanism	ES section reference
with relevant standards and future climate			
Measures to reduce impact of extreme weather on construction	Applicant/Contractor	DCO requirement for **Outline CEMP (Volume 7.12)** and contractor health and safety procedures and risk assessments	**Section 14.9**
Design of the drainage systems to include consideration for resilience to climate change	Applicant	DCO Requirement for **Outline Drainage Strategy (Volume 6.4)**	**Section 14.9**
Waste bunker would be appropriately protected against groundwater ingress and uplift.	Applicant	Review of detailed design	**Section 14.9**
Climate suitable species to be used in landscape planting.	Applicant	DCO Requirement for **Outline Landscape and Ecological Mitigation Strategy (Figure 3.14 Volume 6.3)**	**Section 14.9**
Reduction in the reliance on potable water to be implemented e.g., rainwater harvesting/grey water recycling.	Applicant/EPC Contractor	Development description defined in **Chapter 3: Description of the Proposed Development (Volume 6.2**) and the **Draft DCO (Volume 3.1)**.	**Section 14.9**

14.12 Conclusion

14.12.1 This chapter presents the environmental assessment of the likely significant effects of the Proposed Development with respect to climate during the construction, operation and decommissioning phases of the Proposed Development. This assessment considers climate change in two ways: GHGs and CCR.

GHG emissions

14.12.2 It is concluded that the GHG impact of the Proposed Development will have a **beneficial Significant effect**. The Proposed Development has net GHG emissions below zero, causing an indirect reduction in atmospheric GHG emissions which has a positive impact on the UK Government meeting its carbon budgets/targets.

Climate change resilience

14.12.3 There are **No Significant effects** remaining following the assessment of climate change impacts on the construction, operational and decommissioning phases of

the Proposed Development and its Receptors. This is because all relevant and implementable environmental measures have been employed into all phases of the Proposed Development.